

**The Portrayal of Female Characters in Dickens' Novels *Oliver Twist* and
*Great Expectations***

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Abstract

This paper investigates Charles Dickens' presentation of women and the effect of his perception of women on shaping female characters in his novels *Oliver Twist* and *Great Expectations*. These two novels are selected carefully because they contain a number of odd women and cruel mothers. The first novel to be discussed, one of Dickens' earliest works, is *Oliver Twist*, published between February 1837 and April 1839. The various mother figures for Oliver will be analyzed. The second novel to be investigated is *Great Expectations* which was published between December 1860 and August 1861 and is one of Dickens' last novels. This paper sheds the light on his personal life and his experiences as a child that had a great impact on his view of women. The cruel mother who was happy for sending him to work when he was twelve years old created cruel characters in his novels. The image of caring mothers is almost absent in most of his works. Also, the relationship with his wife was one of the factors for creating such odd characters. On the other hand, the Victorian perception of women has affected greatly on his writing about women. He was sympathetic with the women who were enforced to be prostitutes. As for normal women, very few characters can be found in his novels. Thus, the current study is an attempt to find out the reasons for such dark representation of female characters.

The Portrayal of Female Characters in Dickens' Novels *Oliver Twist* and *Great Expectations*

1. Introduction:

Dickens had many different personal experiences that affected greatly on his writings. His view and representation of women is a reflection of his own personal life. First, his relationship with his mother when he was a child created cruel and careless female characters in his novels. As a young man, in the early 1830s, he loved Maria Beadnell, whose rejection may have provided Dickens with material for Pip's hopeless adoration of Estella. In 1836, Dickens married Catherine Hogarth, with whom he would go on to have ten children. By the time he wrote *Great Expectations*, he had been separated from her for almost two years and was conducting a mostly-secret affair with Ellen Ternan, a young actress. Moreover, women in Victorian Age suffered a lot from many social abuses so Dickens set out to attack some specific abuses existing towards women during that era.

The purpose of this study is to critically analyze Charles Dickens' representation of female characters in *Oliver Twist* and *Great Expectations*. It aims at showing that Charles Dickens is a realist writer whose characters have been created with devotion to the realist and naturalist mode of writing. This paper is an attempt to examine the representation of female characters in *Oliver Twist* and *Great Expectations*, their social status, and show that they all still adhere to Victorian ideals of womanhood. It is during the period of intense public debate about the condition of women particularly, about marriage and about prison reform, that Charles Dickens wrote and published *Great Expectations*. The work was serialized in *All The Year Round* from December 1860 to June 1861.

The feminist study of Dickens' female characters determines that Dickens as a male writer, was sympathetic with the plight of Victorian women. His representation of the female characters is a portrayal of the Victorian ideologies and perceptions towards women. Dickens explores the miserable conditions of the Victorian women and also subtly criticizes the treatment of women by the patriarchal society.¹ The role of actual female figures in Dickens' personal life is also examined in order to find out the

motives and justifications behind his creation of such characters. As for his female characters are concerned, Gissing remarks:

If George Eliot was of opinion that Shakespeare shows himself unjust to women, and on that account could not wholly revere him, we need not be surprised that average members of her sex should see in Dickens something like a personal enemy, a confirmed libeler of all who speak the feminine tongue.²

Michael Slater³ also finds in his critical analysis of the female characters in Dickens' early fiction that "Dickens sees women only as they have been typecast by men as angelic ministers of grace and inspiration, as tormenting charmers, as threatners of male liberty, as trying partners, as gloriously absurd in their distinct femaleness, or as singularly capable of dog-like devotion to men as they love even when they meet with nothing but cruelty and brutality in return".

In the nineteenth century, women lived in an age characterized by gender inequality and discrimination. They enjoyed a few of legal and social rights and they were expected to remain obedient to their fathers or husbands. They were still dominated in many ways. Dickens touches on the issue of gender roles that affected Victorian England at large and on the suffering of poor women during that era. George Letissier writes:

From many regards, Dickens is the emblematic figure of Victorian fiction, if not of the Victorian era. As one might expect, many Post-Victorian novelists write after, or against him.⁴

The nineteenth century novel represents many Victorian conditions in the stories of its characters. It seeks to engage with the contemporary circumstances, and debate about social representation of women dealing with controversies about the nature and the role of women. This paper intends to focus on the fictional representations of the conditions of women, which were as inspiration for several Victorian writers. So, realism is a narrative

technique in Victorian literature attempts to describe life without idealization of romantic subjects. The conditions of women were one of the major concerns of Charles Dickens' novels .He presents women influenced by the Victorian ideology surrounding the role of women in society. He depicts the fallen women, the women who were forced to bear exploitation and oppression and their quest for survival in an industrialized society. The female characters in Charles Dickens' novels are often represented as black or white characters, either proper or improper, there is no way in between, no 'grey zone'. Karen Elizabeth Tatum comments on this by saying:

Dickens' works portray an inability to balance the attraction/repulsion aspects of abjection. Indicative of Victorian culture itself, which Dickens imbibes in his novels, women are portrayed as either Angels or Demons, Sinners or Saints, Virgins or Whores.⁵

2. Dickens' Personal Relationship with women:

Charles Dickens was born on 7 February 1812 in Portsmouth, England, the second son of eight children. Dickens' father was a well-paid clerk, but he was often in debt due to his extreme congeniality and hospitality. He was imprisoned in Marshalsea because of debt, but twelve years old Charles was sent to work at a blacking factory in Hungerford Market, London. After his father's release from debtors' prison, his mother forced him to remain working at the factory, a fact which emotionally scarred him for the rest of his life and had a great effect on his writings. He becomes a realist novelist who tries to reflect the suffering of the people, especially children who are orphans in most of his novels. These experiences led Dickens to base his novels on the social conditions and situations around him. All these experiences were reflected in his writings.

His marriage was not a happy one. From at least the early 1850s, he spoke of a lack of warmth between himself and his wife Catherine Hogarth, whom he had married in 1836. His sister-in-law, Georgina Hogarth, seems to have taken on the duties of housekeeper and hostess after the American tour of 1842. In 1857, the couple moved to separate bedrooms, the door between them being boarded up, and in 1858 they formally split, with all the children,

except the eldest boy Charley, staying with their father. Dickens had a difficult relationship with his wife Catherine. Although she came fairly close to the 'angel of the house' model by being a good housewife and giving him ten children, he was tired of her after 25 years of marriage, and eventually divorced her. The situation was complicated by rumors of his affair with the young actress, Ellen Ternan (1839–1914), which continued until his death. Dickens had met Ternan at Manchester in August 1857, when she acted in a production of *The Frozen Deep*, the play Dickens helped Wilkie Collins write. This situation must have been painful enough for all those involved, but on 7 June 1858 Dickens took the extraordinary step of publishing a personal statement in *The Times*, reprinted in *Household Words* on 12 June, denying rumors about the involvement of other women.

Regarding his relationship with his mother, Tatum argues that the relationship with his own mother was rather thorny:

Although it was Dickens' father that put the family in the poor house, Dickens never forgave his mother for putting him to work in a blacking factory when he was 12 years old. Once he achieved literary fame, he continued to complain about his mother's embarrassing behavior in not dressing according to the standards of his success and the money he gave her, as well as in constantly asking him for money.⁶

For his sister, the relationship with her was somewhat complicated; although he loved her, he was also envious of her because she got the education that was denied to him. Kluger explains the reason for the difficult sibling relationship:

His parents had enough money to pay for schooling, but not for both him and his older sister, Frances. They made what was, in the nineteenth century, the uncommon choice of educating the girl in the family, sending her to the Royal School of Music. Charles went to work in a bootblacking factory.⁷

As a result of all these negative experiences with women, Dickens developed what is called by Tatum⁸ 'a flawed psyche', which may explain his tendency to use the virgin/whore dichotomy in his novels. In *Charles Dickens and the Image of Women* (1993), David Holbrook⁹ relies on psychoanalytic mothering theory to trace patterns in Dickens' relations to women and their effect on his characterizations. Holbrook¹⁰ argues that Dickens' frustrations with his mother for wanting to send him back to the blacking factory when he was a child probably disturbed him as deeply as it did because it emphasized "earlier weaknesses in the relationship". He attributes Dickens' hostilities toward women in his fiction to Freudian "primal fantasies," and he argues that Dickens acted out this fantasy in his dramatic readings of the murder of Nancy in *Oliver Twist*.¹¹

3. Odd women in *Oliver Twist*:

3.1.Fallen women and Prostitutes in *Oliver Twist*:

The term fallen woman in Victorian culture applied "to a range of feminine identities: prostitutes, unmarried women who engaged in sexual relations with men, victims of seduction, adulteresses, as well as variously delinquent lower-class women".¹² Society viewed these women as fallen and as morally and socially corrupt, but they were, in fact, victims of male domination and seduction. They are both described as victims of cruel society and subjects of exploitation. Dickens in his novels tries to show the humanity and the goodness in these characters. In the Preface to *Oliver Twist*, Dickens writes that "It is useless to discuss whether the conduct and character of the girl seems natural or unnatural, probable or improbable, right or wrong. It is true".¹³

Altick attests that "Dickens and other writers of his time associated prostitution with the mechanization of modern life, portraying prostitutes as human commodities consumed and then thrown away like refuse".¹⁴

Poverty obviously forces young girls into prostitution as thought by Dickens through the character of Nancy. Dickens became actively involved with the reformation of prostitutes as noted through the funding of Urania Cottage, a home for fallen women (Rogers). Moreover, he wrote a letter for distribution among women in police custody and he appealed them to change

their ways and advised them to go to a lady in town, probably Angela Burdett – Coutts to be accommodated: “There is a lady in this town who from the windows of her house has seen such as you. . . She has resolved to open at her own expense a place of refuge near London for a small number of females, who without such help are lost forever, and to make a home for them”.¹⁵

3.2.Nancy and Agnes in *Oliver Twist* as prostitutes:

Oliver Twist (1838) is Charles Dickens' second novel that contains a number of odd women. Nancy is one of the central characters in *Oliver Twist*. She belongs to the lowest class of London's underworld. In his preface to the third edition, Dickens writes that he purposely placed her among "the most criminal and degraded of London's population".¹⁶ Clearly Dickens sympathizes with Nancy in *Oliver Twist*, and although she is depicted as a prostitute, Dickens shows the readers that she is one of the victims in this cruel society. Furthermore, Nancy is portrayed not only as a fallen woman and prostitute, but also as a thief, living amongst thieves. Nancy insistently tells Fagin, "I thieved for you when I was a child not half as old as this (pointing to Oliver). I have been in the same trade, and in the same service, for twelve years" (*Oliver Twist*: 133). Thievery, prostitution, abuse and misuse are all Nancy has known since she was a child.

Nancy is represented in the novel as a woman who has a moral conscience, courage, kindness and fear. She suffers from inner conflict between the goodness and the evil and between natural humanity and acquired criminality. At first, she agrees to bring Oliver back to Fagin and Bill Sikes. After that, she tries to protect him from their violence and harsh treatment. She thinks that it is enough for him to be changed from an innocent child into a criminal. Nancy does not want Oliver to suffer like her. Her trembling hand and deadly white face reveal her fear from Sikes and her compassion for Oliver. As Slater notes, Nancy's inner conflict and various emotional mood are dramatized by her sudden pity for Oliver and outbursts against Fagin.¹⁷ The character of Nancy in *Oliver Twist* is very significant since it represents the first concerns of Dickens of fallen women. The novel is filled with disagreeable women. Already at the beginning of the novel, his own mother is represented as a guilty woman. Oliver's mother "Agnes" was seduced as a young adult by a friend of her father. She was brought up with Victorian

morals and like most girls of her age, she remained very naive and sexually ignorant. As a result, she got pregnant without being married and died giving birth to Oliver. Tatum¹⁸ argues that she died because she, as an unmarried woman, was a threat to society: "By having this child out of wedlock, Agnes threatens the social order, and because she threatens the social order, she is abjected from the novel". Dickens' sympathy for prostitutes and fallen women had been clearly established earlier with his vivid presentation of Nancy in *Oliver Twist*.¹⁹ He was well aware that these women were victims of society, poverty and men, and he criticized the cruelty of the Victorian society and peoples view of fallen women. Dickens was well aware that prostitution was a social issue. He had great sympathy for fallen and poor women and saw them as victims of society. Nancy is aware that she stands outside the patriarchal borders (Victorian qualities and domestic ideologies) as we can see when she talks to Rose in a distanced way:

Oh, lady, lady! 'she said, clasping her hands passionately before her face, 'if there was more like you, there would be fewer like me, -there would -there would!' 'Sit down', said Rose, earnestly. 'If you are in poverty of affliction I shall be truly glad to relieve you if I can, - I shall indeed. Sit down' 'Let me stand, lady, ' said the girl still weeping, 'and do not speak to me so kindly till you know me better. It is growing late. Is that door shut? (*Oliver Twist*:64)

Nancy calls Rose lady, which indicates that she has much respect for her. Nancy thinks the world would be a better place if there were only women like Rose. She feels like she does not belong to the era or even the world.

3.3. Cruel women in *Oliver Twist*:

3.3.1. Mrs. Mann

After the death of Oliver's mother, he is taken to a baby-farm, supervised by Mrs Mann. She is the first mother figure that Oliver encounters in his life. Unfortunately for him, she is not much of a mother at all. Instead of properly raising the orphans under her care, she prefers to largely keep the weekly wages she receives for them; causing the orphans to be malnourished and poorly dressed, as can be seen in the following excerpt:

Upon this the parish authorities magnanimously and humanely resolved, that Oliver should be "farmed," or, in other words, that he should be dispatched to a branch-workhouse some three miles off, where twenty or thirty other juvenile offenders against the poor-laws, rolled about the floor all day, without the inconvenience of too much food or too much clothing, under the parental superintendence of an elderly female, who received the culprits at and for the consideration of seven pence-halfpenny per small head per week. Seven pence-halfpenny's worth per week is a good round diet for a child; a great deal may be got for seven pence-halfpenny, quite enough to overload its stomach, and make it uncomfortable (*Oliver Twist*: 5-6).

Mrs. Mann uses the weekly wage she receives for the orphans to her own benefit instead of properly feeding or clothing the children.

The elderly female was a woman of wisdom and experience; she knew what was good for children; and she had a very accurate perception of what was good for herself. So, she appropriated the greater part of the weekly stipend to her own use, and consigned the

rising parochial generation to even a shorter allowance than was originally provided for them (*Oliver Twist*: 5-6).

In these first years of his life, Oliver is confronted with only negative mother-figures. Michael Slater states:

There are fully developed, sympathetic sisters and daughters in Dickens' novels, but not many good, biological mothers live far past childbirth. If they do, either they are, consequently, not good mothers or they are old, widowed, and grandmotherly, like Mrs. Maylie or Mrs. Bedwin.²⁰

Tatum²¹ agrees with Slater by saying that "The bad mother figures in the novel, like Mrs. Corney, the matron of the workhouse, Mrs. Mann, the matron of the baby farm, and Mrs. Sowerberry, the undertaker's wife, are odiously present. Their overbearing presence, resulting from the fact that they survive long after childbirth, is depicted as precisely what makes them bad mothers." There is, consequently a clear female opposition in the novel; either the women are reasonably young, do not fulfill the biological mother role but take on the care of infants (like Mrs. Mann or Mrs. Sowerberry), or they are able to be affectionate towards the child but are represented as aged.

3.3.2. Mrs. Sowerberry in *Oliver Twist*:

Mrs. Sowerberry is to become the second mother-figure in his life. She is described in the novel as "a short, thin, squeezed-up woman; with vixenish countenance" (*Oliver Twist*: 26).

Already on the night of Oliver's arrival, the motherly commitment of Mrs. Sowerberry is displayed. To still Oliver's hunger, she feeds him "the dainty viands that the dog had neglected" (*Oliver Twist*: 29). The relationship between Oliver and Mrs. Sowerberry becomes worse due to bad attitude of Mr. Sowerberry towards Oliver. Together with Charlotte the maid and Noah the apprentice, Mrs. Sowerberry forms an alliance against poor Oliver: "Charlotte treated him ill, because Noah did; and Mrs. Sowerberry was his decided enemy, because Mr. Sowerberry was disposed to be his friend" (*Oliver Twist*: 37). In addition, Mrs. Sowerberry seems to be the dominant person in the Sowerberry household, as can be seen in the excerpt beneath:

Mr. and Mrs. Sowerberry were taking their supper in the little back parlor, when Mr. Sowerberry, after several deferential glances at his wife, said, "My dear-" He was going to say more; but, Mrs. Sowerberry looking up, with a peculiarly unpropitious aspect, he stopped short. "Well," said Mrs. Sowerberry, sharply. "Nothing, my dear, nothing," said Mr. Sowerberry. "Ugh, you brute!" said Mrs. Sowerberry. "Not at all, my dear," said Mr. Sowerberry humbly. "I thought you didn't want to hear, my dear. I was only going to say-" "Oh, don't tell me what you were going to say," interposed Mrs. Sowerberry. "I am nobody; don't consult me, pray. I don't want to intrude upon your secrets." As Mrs. Sowerberry said this, she gave an hysterical laugh, which threatened violent consequences (*Oliver Twist*: 30).

Mrs. Sowerberry has the habit of weakening the personality of her husband and she controls him. In a patriarchal society like the Victorian, this would probably have evoked disgust in many readers. Not only is she completely neglecting Oliver's needs, she is also threatening society by being more dominant than her husband. She is truly a grotesque wife and mother. Mr. Sowerberry does not dare to speak anything in front of her without taking her permission:

This is a very common and much-approved matrimonial course of treatment, which is often very effective. It at once reduced Mr. Sowerberry to begging, as a special favor, to be allowed to say what Mrs. Sowerberry was most curious to hear. After a short altercation of less than three quarters of an hour's duration, the permission was most graciously conceded (*Oliver Twist*: 30).

When Oliver has a dispute with the charity boy Noah Claypole; Mrs. Sowerberry, perhaps seeing the opportunity to finally put Oliver in his place, interferes. Instead of investigating the cause of the fight, she immediately takes Noah's side and convinces her husband to punish Oliver severely. Mr. Sowerberry does not intend to punish the boy, but after hearing his wife's lamentation, he is morally obliged to do it, otherwise he would be considered as being a cruel husband to Mrs. Sowerberry, as is demonstrated in the following excerpt:

Mrs. Sowerberry burst into a flood of tears. This flood of tears left Mr. Sowerberry no alternative. If he had hesitated for one instant to punish Oliver most severely, it must be quite clear to every experienced reader that he would have been, according to all precedents in disputes of matrimony established, a brute, an unnatural husband, an insulting creature, a base imitation of a man, and various other agreeable characters too numerous for recital within the limits of this chapter...The flood of tears,

however, left him no resource; so he at once gave him a drubbing, which satisfied even Mrs. Sowerberry herself, and rendered Mr. Bumble's subsequent application of the parochial cane, rather unnecessary (*Oliver Twist*: 44).

Oliver is maltreated by this cruel woman who has no mercy at all for the little child. Tatum²² says "it would seem that in *Oliver Twist*, the only "good" mothers are dead mothers."

4. Cruel and Odd women in *Great Expectations* :

4.1. Miss Havisham:

Great Expectations is filled with many female characters who are presented differently by Charles Dickens. Throughout the novel, Pip is confronted with several women of different qualities. The most important female character in this novel is Miss Havisham. She is introduced in the novel "as an immensely rich and grim lady who lived in a large and dismal house barricaded against robbers, and who led a life of seclusion." (*Great Expectations*: 89). In his first encounter with Miss Havisham, he describes her as the "strangest lady I have ever seen, or shall ever see" (*Great Expectations*: 99). Paul Davis²³ describes her as "the bizarre recluse who lives in a ruined mansion dressed in the tattered bridal gown that she has worn since she was left standing at the altar many years before". Miss Havisham remains in a constant state of melancholia, which was caused by her unsuccessful relationship of love with the unsuitable man. Unable to cope with her failure to satisfy society's expectations of single women, Miss Havisham turns into a corpse-like, self-loathing demon - an abject entity whose sole purpose is to use Estella to achieve her vengeful ambitions and implicitly succeed in avenging herself against men. Miss Havisham has often been described by critics as one instance of an irrational and vindictive female figure embodying the mythic horrors of countless cruel mothers, stepmothers, and witch-like figures. Comparing her to other Dickensian women who are perverted by passion, Micheal Slater asserts that "Miss Havisham is the most compelling and the most haunting".²⁴

The cause of Miss Havisham's misery lies in her being betrayed by her lover Compeyson on her wedding day. The man fooled her with false promises of love, took precious gifts from her, promised to marry her but on the wedding day did not turn up and thus left her with a broken heart. As a result, she regards all men as being enemies to her so she decided to take revenge from them by employing Estella to break their hearts. Pip strongly reproaches Miss Havisham for keeping him in the dark and playing with his emotions. Miss Havisham tells Pip about her past and tells him "what real love is. It is blind devotion, unquestioning self-humiliation, utter submission, trust and belief against yourself and against the whole world, giving up your whole heart and soul to the smiter - as I did!" (*Great Expectations*:425-26). When Pip expresses his intense love for Estella in front of Miss Havisham, she expresses her deep remorse by stating "What have I done! What have I done!" (*Great Expectations*:709). She confesses before Pip that when Estella came to her as a child, she wanted to save her from misery, nothing else. But then,

. . . as she grew, and promised to be very beautiful, I gradually did worse, and with my praises, and with my jewels, and with my teachings, and with this figure of myself always before her a warning to back and point my lessons, I stole her heart away and put ice in its place. (*Great Expectations*:711)

Thus, Miss Havisham realized her wrong-doings, but by that time it was too late. Estella really became a hard-hearted woman who cannot feel any love or affection even for her true lover Pip and makes her life worse than hell by marrying a heartless brute Bentley Drummle. H.P. Sucksmith refers to "the extremely powerful effect and vision which the figure of Miss Havisham contributes to *Great Expectations*".²⁵ Miss Havisham's love story and its disastrous results are presented to us via Mr Pocket, Herbert, and Pip. Herbert tells Pip her history as follows:

The marriage day was fixed, the wedding dresses were bought, the wedding tour was planned out, the wedding guests were invited. The day came, but not the bridegroom. He

wrote a letter—Which she received, I struck in, 'when she was dressing for her marriage? At twenty minutes to nine?'

'At the hour and minute,' said Herbert, nodding, at which she afterwards stopped all the clocks. What was in it, further than that it most heartlessly broke the marriage off, I can't tell you, because I don't know. When she recovered from a bad illness that she had, she laid the whole place waste, as you have seen it, and she has never since looked upon the light of day. (*Great Expectations*:160)

Abandonment by Compeyson is a sudden blow to Miss Havisham. She has to suffer from violent shock and permanent agony together. Dickens emphasizes the threatening effect of emotional troubles on mental illness by adding Pip's nightmare after rescuing Miss Havisham from the fire. Pip is, for a while, haunted by his fearful memory of the fire and of Miss Havisham in anguish. Dickens focuses more on Pip's emotional shock than on physical injury caused by the burns: "This pain of the mind was much harder to strive against than any bodily pain I suffered" (*Great Expectations*: 360).

Miss Havisham is described as: "she had the appearance of having dropped body and soul, within and without, under the weight of a crushing blow" (*Great Expectations*: 52).

Pip's reproach of Miss Havisham echoes a general treatment of mental illness: "in seclusion, she had secluded herself from a thousand natural and healing influences" (*Great Expectations*:355). However, she is prohibited from these treatments because she is socially unwanted. As Michel Foucault discusses, "detention or reclusion is a form of punishment. Thanks to her wealth, Miss Havisham is saved from enforced incarceration in a lunatic asylum. But, she is compelled to confine herself apart from society by a social imperative because she fails to accomplish women's normative social roles: marriage and mothering."²⁶ Pip is shocked when he sees the old lady in her old yellowish bride dress. He also notices that her watch and the clock in the room 'had stopped at twenty minutes to nine' (*Great Expectation*: 57). Seeing the strange old lady with an awkward appearance who had never left the room since her

dramatic misfortune, who wanted diversion, and who had sick fancies to have someone play around her is an abnormal thing which Pip tries to understand.

Before she spoke again, she turned her eyes from me, and looked at the dress she wore, and at the dressing-table, and finally at herself in the looking-glass. 'So new to him,' she muttered, 'so old to me; so strange to him, so familiar to me; so melancholy to both of us! Call Estella.' (*Great Expectations*: 58)

Dickens highlights two important facts about human psychology and human nature using Miss Havisham's unfortunate love affair. The first fact is that people sometimes blame others for any personal bad treatment or a mistake. Secondly, when people find themselves in a bad or terrible situation, they look around to see whether they are suffering alone or not. Seeing other fallen people suffer like them gives them satisfaction. To be clearer, Miss Havisham wants to see a broken-hearted gentleman who has been abandoned by his female lover that is the reverse of her situation. She wants to take revenge from all men by using Estella. Pip becomes the candidate for the 'broken-hearted' gentleman. Miss Havisham's devilish plan starts to work and Pip begins to think differently. Eventually, he starts to feel ashamed of his home, of his coarseness and commonness.

4.2. Mrs Joe Gargery:

The other female character who is cruel and odd in the novel *Great Expectations* is Mrs. Joe Gargery. She is the first female character to be introduced in *Great Expectations*. She is Pip's elder sister and wife of blacksmith Joe Gargery. Mrs. Gargery is twenty years older than Pip and has earned quite a "reputation with herself and the neighbours because she had brought him up 'by hand.'" (*Great Expectations*: 11). Mrs Joe's given name is never revealed in the text, significantly she takes the patronymic, Mrs Joe, rather than any female name, because Mrs. Joe is a violent woman, possessing violence that is usually attached to male than female. The writer wants to convey that this woman does not have the normal qualities of women. Pip describes his feelings of fear because of her in the following passage:

Having at that time to find out for myself what the expression meant, and knowing her to have a hard and heavy hand, and to be much in the habit of laying it upon her husband as well as upon me, I supposed that Joe Gargery and I were both brought up by hand. (*Great Expectations*: 11)

Pip's description of the physical features of his sister is quite interesting. According to him, she was not a good-looking woman and that "she must have made Joe Gargery marry her by hand" (*Great Expectations*: 11). About her manners, Pip states that "she never was polite, unless there was company" (*Great Expectations*: 21). Mrs. Joe Gargery has a strange way of cleaning the house. Pip thinks that she has an exquisite art of making her cleanliness more uncomfortable and unacceptable than dirt itself (*Great Expectations*: 37). Although Mrs. Joe Gargery does not show her love and affection for her husband, she is full of jealousy when she comes to know that Miss Havisham wishes to see her husband Joe Gargery to discuss some serious issues related to Pip. If jealousy is a sign of love, Mrs. Joe Gargery does really love her husband as is evidenced in her extreme anger on this occasion:

When I got home at night, and delivered this message for Joe, my sister 'went on the Rampage,' in a more alarming degree than at any previous period. . . . she threw a candlestick at Joe, burst into a loud sobbing, got out the dustpan . . . and began cleaning up to a terrible extent. Not satisfied with a dry cleaning, she took to a pail and scrubbing-brush, and cleaned us out of house and home, so that we stood shivering in the backyard (*Great Expectations*:173).

Joe professes his feelings for Mrs. Joe to Pip: "Whatever family opinions, or whatever the world's opinions, on that subject may be, Pip, your sister is . . . a fine figure of a woman!" (*Great Expectations*: 82). When Pip asks why he does not rise against Mrs Joe, the blacksmith explains:

This I want to say very serious to you, old chap - I see so much in my poor mother, of a woman drudging and slaving and breaking her honest heart and never getting no peace in her mortal days, that I'm dead afraid of going wrong in the way of not doing what's right by a woman, and I'd fur rather of the two go wrong the t'other way, and be a little ill-convinced myself. I wish it was only me that got put out, Pip; I wish there weren't no Tickler for you, old chap; I wish I could take it all on myself (*Great Expectations*:80).

She is an aggressive woman contrast to the ideal gentle, obedient, kind and caring woman that should characterize Victorian woman. Mrs Joe is the first of the violent women in *Great Expectations* to be punished, violently. She has created a terrible scene of screaming abuse at Orlick in the smithy, and the narrator, recalling this scene, adds:

I must remark of my sister, what is equally true of all the violent women I have ever seen, that passion was no excuse for her, because it is undeniable that instead of lapsing into passion, she consciously and deliberately took extraordinary pains to force herself into it, and became blindly furious by regular stages (*Great Expectations*: 142).

This statement by Pip confirms that he has had many encounters with violent women. Mrs. Joe has been brutally attacked:

...lying without sense or movement on the bare boards where she had been knocked down by a tremendous blow on the back of the head, dealt by some unknown hand when her' face was turned towards the fire - destined never to

be on the Rampage again. (*Great Expectations*:147)

When Mrs Joe dies, her final words are 'Joe', and 'Pardon' and 'Pip' (*Great Expectations*:302). Thus the violent woman seeks forgiveness from her victims. Mrs Joe has refused the domestic ideal: she is not the angel in the house but a devil.

4.3. Estella:

Estella is Miss Havisham's adopted daughter, at whose hands Pip experiences emotional violence for the first time, Estella's contempt for his coarse hands and thick boots being, Pip recalls, 'so strong that it became infectious' (*Great Expectations*: 90). Before he leaves Satis House after his first visit, Estella brings Pip food and drink:

She put the mug down on the stones of the yard, and gave me the bread and meat without looking at me, as insolently as if I were a dog in disgrace. I was so humiliated, hurt, spurned, offended, angry, sorry - I cannot hit upon the right name for the smart - God knows what its name was - that tears started to my eyes. (*Great Expectations*: 92)

Brought up by Miss Havisham in the dark house is so suggestive of a punitive asylum, Estella's mental soundness is misused. Miss Havisham later confesses to Pip: "I stole her heart away and put ice in its place" (*Great Expectations*: 356). Miss Havisham originally intends that Estella should not suffer the misery which arises from susceptibility. Yet, as Estella becomes handsome, Miss Havisham thinks of taking revenge on society which excludes her, using Estella as an instrument. In terms of the physiological explanation of the human mind, Miss Havisham hardens Estella's heart. Estella grows to be icy and heartless, unlike Miss Havisham whose susceptible heart is her ruin. Estella says to Pip, "I have a heart to be stabbed in or shot in...if it ceased to beat I should cease to be. But you know what I mean. I have no softness there, no sympathy – sentiment - nonsense" (*Great*

Expectations: 211). As a result of the dehumanization by Miss Havisham, Estella views her heart merely as the organ of circulating blood. Her defiance of Miss Havisham is characteristic of a heartless woman. Miss Havisham, in a rage, curses her ward: “You stock and stone!...You cold, cold heart!” (*Great Expectations*:271). On the other hand, Estella, in the quarrel, composedly points out her guardian’s illogic: “When have you found me giving admission here [the heart]...to anything that you excluded? Be just to me” (*Great Expectations*: 272). Pip has great love to Estella. He says: 'I loved her against reason, against promise, against peace, against hope, against happiness, against all discouragement that could be' (*Great Expectations*:253-4). Miss Havisham’s plan is to make Pip smitten by Estella’s beauty and to desperately beg her to marry him. Estella, on the other hand, is a fake. She is born in the lowest layer of the low class, yet she is educated by Miss Havisham to become a lady and behave as if she were born in the upper class. Therefore, Estella’s poor, criminal origin (her mother was a murderess) is revealed in the scene in which she gets pleasure in ‘animal aggression’. Gilmour pinpoints this fact and uses the Pip-Herbert fight scene in order to show her real face:

The brief scene enacts the supreme paradox of Pip’s life: Estella can only respond to him when he exhibits those qualities of physical force and animal aggression which, in order to win her, he is at pains to civilize out of himself. It [her kiss] is her one spontaneous gesture to Pip and he misreads it, feeling only guilt and remorse at this exercise of his blacksmith’s arm.²⁷

Estella remains a ‘star’ to Pip, a star he cannot reach at all in the original version and ending of the novel. In the second version – as the happy ending was a public requirement – they meet at Satis House again and, as they leave “the ruined place,” Pip says that he sees “no shadow of another parting from her.” (*Great Expectations*: 478) implying that they may get together and live happily ever after. In this respect, Philip V. Allingham claims that:

The futile love affair with Estella – bright, and distant, and cold as the stars for which he has named her – reflects young Dickens' own

hopeless infatuation with a banker's daughter, Maria Beadnell. Significantly, in the original ending Dickens did not reward Pip for his struggles by arranging the traditional happy ending for the lovers.²⁸

5. Normal and kind-hearted women in Dickens' Novels:

5.1. Rose in *Oliver Twist*

In *Oliver Twist*, Dickens represented most female characters as either cruel or being exploited by the society, but there are few characters who are represented as pure and perfect. In this novel, Rose is the ideal lady in the novel. Dickens describes her as an angel, a woman with good moral values and standards. She is clearly a symbol of the Victorian ideals. Rose is young, pure and beautiful, with good moral standards. Her angelic qualities seem to correspond to the Victorian ideals of women. She is described as "gold with its unique qualities" (*Oliver Twist*:63). Rose is surrounded by good people, especially compared to the other women in the novel. She is surrounded by people that keep her in the "proper domestic sphere" (*Oliver Twist*:64).

She exemplifies all the attributes of the "mould": she is young, beautiful, frail, mild, gentle, pure, ethereal, intelligent, sweet, pleasant, charming, coy and blessed. She even possesses the right physiognomy ("intelligence...stamped on her noble head"), and she is performing domestic tasks, adorning both table and self for the gratification of others. The "blessed" spirits give her approval. Even Nancy calls her the angel lady. (*Oliver Twist*:64)

Rose Maylie is an admirable Dickensian woman who represents the ideal woman of the Victorian era, innocent, sexless and pure. She becomes an orphan when her father dies, but is adopted by Mrs. Maylie. Mrs Maylie nurtures her and gives her an identity. She spreads happiness and goodness with her angelic character. The author introduces her by saying that:

Rose Maylie was in the lovely bloom and spring-time of womanhood; at that age when, if

ever angels be for God's good purposes enthroned in mortal forms, they may be without impiety supposed to abide in such as hers. She was not past seventeen. Cast in so slight and exquisite a mould, so mild and gentle, so pure and beautiful, that earth seemed not her element, nor its rough creatures her fit companions. (*Oliver Twist*: 235)

The environment is important for the creation of a good woman in *Oliver Twist*. Rose was rescued as an orphaned child and raised by Mrs. Maylie. The following extract shows the effect of the environment in creating a good female personality:

Thank Heaven upon your knees, dear lady,' cried [Nancy], 'that you [Rose] had friends to care for and keep you in your childhood, and that you were never in the midst of cold and hunger, and riot and drunkenness, and—something worse than all—as I have been from my cradle; I may use the word, for the alley and the gutter were mine, as they will be my deathbed. (*Oliver Twist*: 334)

Rose represents a model of a perfect woman. She is nice, kind, and compassionate. She takes care about her husband and home. She is like an angel and brings enjoyment of life to all the people around her. She believes, as Oliver, that the surrounding world is good even though she experienced terrible childhood. Because Rose knows what it is like to be rescued from an unhappy childhood, she urgently wants to rescue Oliver. In that way, she represents all the good instincts of Victorian society. Rose suggests for Nancy that she can rescue herself, change her life and be a good person, but Nancy rejects it for love of Sikes. In the novel, Rose is the model of female virtue who becomes one of the few memorable normal female characters in Dickens' novels. Seventeen years old at the time of the novel's events, she is set up as a dramatic foil to Nancy, who is around the same age and sees her own degradation in contrast to Rose.²⁹ Rose rejects Harry's love and proposal

because she belongs to a lower social rank and would bring him only ridicule and problems. Towards the end of the novel, Rose becomes seriously ill and is apparently on the point of death. Harry hastens to her side and declares his love for her. She recovers and the couple are married.

5.2. Bidy in *Great Expectations*:

Biddy is a female character who is introduced by the narrator Pip as the grand-daughter of Mr. Wopsle's great-aunt. She was also an orphan like Pip and was also brought up "by hand". Bidy is one of the most agreeable characters created by Dickens. According to Pip, she "managed her whole domestic life, and wonderfully too" (*Great Expectations*: 124). Moreover, Bidy is intelligent:

For, I called to mind now, that she was equally accomplished in the terms of our trade, and the names of our different sorts of work, and our various tools. In short, whatever I knew, Bidy knew. Theoretically, she was already as good a blacksmith as I, or better. (*Great Expectations*:124).

Bidy, Pip's first teacher, is the example of Dickens' ideal women in *Great Expectations*. Throughout the novel, Bidy appears as the moral and virtuous country girl. She is a simple and kindhearted country girl who first befriends Pip when they attend school together. After Mrs. Joe is attacked and becomes invalid, Bidy moves into Pip's home to care for her. Throughout most of the novel, Bidy is a contrasting figure to Estella. Her plainness, frankness, and kindness are completely opposed to Estella's cold beauty, dishonesty, and cruelty.

Pip is amazed at Bidy's perfection and domestic skill, coupled with the knowledge she possesses. It is a surprise to him because he does not expect a woman to be as intelligent as Bidy is. Although she is intelligent, she is passive and does not threaten male personality or dominance which is highlighted in her repeated statement: "You know best, Pip" (*Great Expectations*:125). Like the typical nineteenth century virtuous women, Bidy is rewarded with marriage at the end of the novel. Although Bidy is portrayed as an insignificant character in the novel, she actually fulfils the

Victorian perception of true womanhood despite the class to which she belongs. According to Dickens, Biddy is the perfect “angel in the house” because of her domestic skills and her ability to perform the masculine trade in which Pip and Joe are involved. Though Biddy does not study as much as Pip does, she is clever. Pip confesses this fact openly:

Biddy, said I, how do you manage it? Either I am very stupid or you are very clever. How do you manage to learn everything that I learn, and always to keep up with me? when I come in from the forge of a night any one can see me turning to at it. But you never turn at it, Biddy.
(*Great Expectations*, 117)

Biddy has taught Joe how to read and write. After Joe leaves, Pip decides to rush home after him and marry Biddy, but when he arrives there he discovers that she and Joe have already married.

The ideal Victorian woman is more attached to the home and was the embodiment of everything domestic and feminine. She subordinated her own desires to those of her husband and children, while acting as the moral guide for her family. In *Great Expectations*, Biddy fits the ideal woman and is rewarded with a good husband and happy ending

6. Conclusion:

This paper is an attempt to investigate the portrayal of women in two novels by Dickens, namely *Oliver Twist* and *Great Expectations*. These two novels were selected carefully as the first was written in the beginning of Dickens' literary life, while the second was written at the end of his literary life. So, the researcher tried to find out the development and the difference in representing the women in two different novels written in two different periods of the writer's life.

It is a fact that a literary text represents the age in which it was written and the personal life of its writer. It is obvious that Dickens' relationships with his mother and his wife affected greatly on the representation of female characters in his novels. Dickens represented the women in two different ways. The first pattern of women represented in these two novels is the pattern of female unfaithfulness in grotesque mothers and mother-figures who

are punished for their sins. Odd and cruel female characters are more common in his fiction than pure female characters. On one hand, grotesque representation of the women in his novels is like an appeal to society to solve the problems facing poor women and develop their crucial conditions. He wants from the society to reform prostitutes and “fallen women” by providing them with opportunities for a better life . Unlike other people, Dickens recognizes the factors that lead women into prostitution, which are poverty and negligence from family and society. Dickens’ artistic creation of characters who represented reality, indicates his social concern and the desire to speak for women, who were among the underprivileged members of society. He used literary art as a means to expose some social ills which subjugated some women to severe injuries and even premature death. His works are instrumental in implementing social reforms.

On the other hand, Dickens experienced some bitter experiences as a child in his life, because of the cruelty of his mother and that created so many cruel female characters in his novels. This paper has shown that Charles Dickens’ life experiences played a major role in shaping his female characters.

The second pattern is the pattern of young, delicate females who reflect his own ideal female as well as the ideal females who conform to conventional Victorian culture. In *Oliver Twist*, Rose reflects Dickens' expectations of the female character in Victorian times. She has the dutiful and devoted characteristics of the angel in the house, while also exhibiting good housekeeping skills. This is the young woman whom Dickens had wished his own wife to be like.

In *Great Expectations*, Biddy fits the ideal mold and is rewarded with a good husband and happy ending, but the women who do not conform to social norms are punished. Mrs. Joe’s pride, cruelty and tough behavior ends with a decisive blow. Estella’s cold heart is punished in her marriage to a snobbish man. Miss Havisham is particularly a strange character. She cannot live a normal life. She is deceived by her finance who does not appear in the wedding. As a result, she decides to take revenge from all men by employing the beauty of Estella. Estella is used as an instrument of revenge to be used against all men. Miss Havisham wants Estella to break the hearts of men. Driven mad and vengeful by heartbreak, she also neglects her feminine and domestic duties—failing to wash, brush her hair, change her clothes or clean her house. Miss Havisham's rage and ruthlessness are finally exorcized by

fire. In the end, she repents after realizing the terrible injury she has done to Estella and Pip. These Female characters show that Dickens was unsympathetic to women who socially rebel. Peter Schecher in his essay Gender and Class in Dickens suggests that "it was the author's own marital disaster that inspired his current impatience with women who were aggressive or non-conformist. His separation from Catherine Hogarth in 1858 was particularly nasty and could have affected his perspective" .³⁰ In these two novels, various women were depicted to show Dickens' different views towards women. Regarding prostitutes, he feels sympathetic with them because they are innocent victims of society. Nancy and Agnes are examples of fallen women in *Oliver Twist*.

In brief, Dickens' childhood experiences and unsuccessful marriage shaped cruel and odd female characters in his novels. In *Oliver Twist*, we find cruel mothers and mothers-like as Mrs. Mann and Mrs. Sowerberry. In *Great Expectations*, we find a cruel sister Mrs. Joe, Miss Havisham and Estella who are all representatives of odd women.

For ideal female characters, they are found rarely in these two novels: Rose who plays a major role in *Oliver Twist* and Biddy who appears at the end of the novel *Great Expectations*. Cruel and odd female characters are more dominant than good characters. In *Oliver Twist*, the writer shapes a variety of female characters: the prostitute, cruel and odd characters and very few good characters. For *Great Expectations*, he shapes the image of cruel and odd characters and we find only one good female character ,Biddy, who does not play a major role in this novel. *Great Expectations* was written at the end of Dickens life so his failure in marriage and love is reflected in shaping his female characters in his novel.

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**Non-destructive Micro-characterization of Gamma Irradiation Effects
on Borosilicate Glass $BaO-2B_2O_3-3SiO_2$ by Acoustic Signature**

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Abstract

In this paper, we investigate gamma-radiated effects on the elastic acoustic parameters (reflection coefficients $R(\theta)$, acoustic signatures $V(z)$, critical angles of wave excitation, spatial periods, velocities) of barium lead borosilicate with the different gamma-radiated dose rate of 0, 3, 6, 9, and 12. The radiation effects on structural and elastic properties were evaluated by measuring the ultrasonic velocities. It was found that, as Gamma radiation dose rate increases, longitudinal velocities vary from 4172 to 4344 m/s whereas Rayleigh velocities vary from 2991 to 3084 m/s. Hence, we first deduce the values of propagating surface acoustic wave velocities, and in the second step we find the values of bulk and surface velocities before radiated and after Gamma-radiated glass samples. The effect of Gamma irradiation dose range from 0 Gy to 12 Gy effects on the acoustic signature, $V(z)$ amplitudes and periods and reflection coefficients $R(\theta)$ critical angles of wave excitation of these glasses is also reported. The calculated reflectance functions that experience several features near critical angles at which longitudinal, shear and Rayleigh modes are existed depend on Gamma radiation dose. It has been observed that, irradiation of the glasses with the Gamma rays increases the BO_3 groups and the non bridging oxygen which make the network loose.

1 INTRODUCTION

Borate glasses are very interesting amorphous materials considering their specific structure and physical properties. In recent years, research has paying attention on the development of new types and scientifically important materials as Borosilicate glasses that motivate forming system and often used as a dielectric insulating and good chemical resistance material [1]. Organic materials as well as some glassy ones, especially polymers, have been increasingly interesting for different purposes such as thick films technology ink constituents. Therefore, the scientific information of the glass structure before and after irradiation is a requirement for understanding the structural progress of nuclear glasses under continuing irradiation during storage of radioactive wastes or isotopes sources, radiation shielding, radiation detection by using glass dosimeter, etc.[2]. Studies on irradiated glasses have been previously published on simple glass systems such as silicate glasses [3] or on multi-component glasses such as borosilicate glasses [4-6]. Several earlier work

known that lead borate glass is interest because of the occurrence of the boron anomaly foremost to rich in glass chemistry [7]. Therefore, the structure and the classification of the main structural groups of borosilicate glass has been widely studied by using a number of techniques, as this system has a extensive diversity of technological applications such as; optical lenses, nuclear waste materials, shielding materials and use in the electronics industry [8, 9]. The potentials and inter-atomic forces in the lattice structure are the important parameter related to properties of glass. Thus, changes in the lattice, due to doping and/or radiation can be directly affected [10-14].

In the other hand, the ultrasonic non-destructive pulse-echo technique plays a important role n understanding the structural properties of glass network and evaluating the acoustical parameters, such as longitudinal, shear and Rayleigh ultrasonic wave velocities, elastic moduli [15-18]. These parameters give information about the microstructure as well as the behavior of the network formers and change in the glass [19-21].

Gamma irradiation causes changes in the physical properties of materials. Where, Gamma irradiations scattering and absorption generally related to the density and atomic number of material sample. Conversely, in composite materials, the important is knowledge of the mass attenuation coefficients, as well as the relation to density and effective atomic number, is of prime [22]. Conventional influence due to Gamma irradiation in glass producing defects where can be Clearfield by UV-visible spectroscopic work [22, 23]. Electronic processes change is the principal effect of ionizing radiation. Particularly, these effects take place because electrons are excited to leave their normal positions and move through the glass set of connections. Ultrasonic velocities were measured as a function of composition, from which elastic resistances of the network former and the modifier are obtained on the basis of the theory of elastic internal energy [24].

2 MATERIALS AND COMPUTING PROCEDURE

2.1 MATERIALS

A series of barium lead borosilicate glass samples were choosing consistent with the formula, $x\text{BaO}-(50-x)\text{PbO}-20\text{B}_2\text{O}_3-30\text{SiO}_2$ ($x = 2$ mol. %). The starting materials used in the experimental study were reagent grade BaO, PbO,

B₂O₃ and SiO₂. It was mixed together and calculated to give a sample of 50g. The homogeneity of the mixture of chemicals was achieved by repeated grinding using agate mortar. The powder mixture was then put in appropriate clay crucibles and heated in melting furnace at 1250 °C for 4 h. These melts were cast in a stainless steel mold and annealed at 450 °C for 2 h and allowed to cool to room temperature [24].

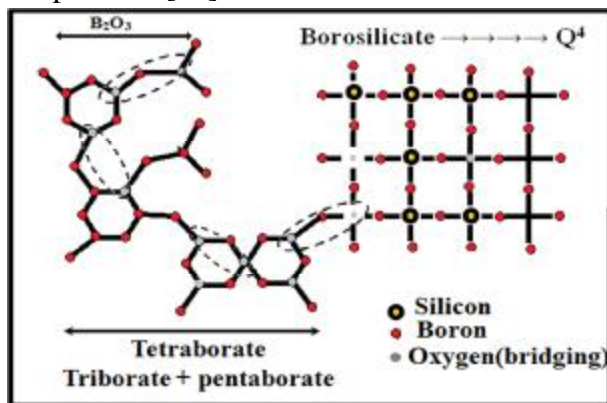


Fig. 1. showed combination of triboratepentaborate units. Filled circles and open circles represent boron and oxygen atoms, respectively. Dashed lines in the structures denote connections to the network, and charges are shown for the non- bridging oxygen (NBO) in the metaborate groups [24].

2.2 GAMMA IRRADIATION

The glass samples were radiated by exposure machine (THERATRON 780C) using ⁶⁰Co c-ray source at a dose rate of 174.70 cGy min and field size of 30×30 cm² at 80 cm from the source at room temperature. The different doses of irradiation were achieved by exposing the sample to the source of different periods. The used Gamma-ray dose rates are 3, 6, 9 and 12 Gy, respectively [24]. It was shown in table 1. that the densities of the glass samples increase with increasing the irradiated by Gamma radiation rates.

Table 1

Experimental data [24] of longitudinal and shear Velocities in BaO-PbO–20B2O3–30SiO2 Doses of Irradiation.

Dose (Gray)	ρ (kg/m ³)	V_L (m/s)	V_S (m/s)
0	4212	4200	2186
3	4222	4234	2219
6	4231	4273	2258
9	4241	4318	2303
12	4253	4372	2357

2.3 NONDESTRUCTIVE TESTING AND CALCULATING PROCEDURE

The calculation method, illustrated in detail somewhere else [17-23], which is consists of a number of steps:

1. calculating the reflection coefficient, $R(\theta)$ from equation (1) [14]:

$$R(\theta) = \frac{Z_L \cos^2 2\theta_S + Z_S \sin^2 2\theta_S - Z_{L1q}}{Z_L \cos^2 2\theta_S + Z_S \sin^2 2\theta_S + Z_{L1q}} \quad (1)$$

where Z_L liquid longitudinal impedance, Z_S liquid transversal impedance, ρ_{Liq} coupling liquid density and V_{Liq} the propagating wave velocity in the liquid which can be calculated from Eq.2.

$$Z_{L1q} = \frac{\rho_{L1q} V_{L1q}}{\cos \theta_i}, Z_L = \frac{\rho V_L}{\cos \theta_l}, Z_S = \frac{\rho V_S}{\cos \theta_s}$$

2. Calculating the acoustic signature $V(z)$ curves of the full specimen-lens system from the angular spectrum model [18] given by the Eq. 3 :

$$V(Z) = \int_0^{2\pi} P(\theta)^2 R(\theta) e^{i2kz \cos \theta} \sin \theta \cos \theta d\theta \quad (3)$$

where $P^2(\theta)$ is the pupil function, θ is the half-opening angle of the lens, z is the defocusing distance and is the wave number in the coupling liquid, $j = \sqrt{-1}$.

3. deducing acoustic signature $V(z)$ of the sample by subtracting the response of the lens $V_L(z)$ from $V(z)$,
4. applying fast Fourier transform, FFT, a spectral technique to the obtained signal $V(z)$, in order to determine spatial periods Δz , deducing the phase velocity of the corresponding mode from the following relation (4) [18]:

$$V_R = \frac{V_{Liq}}{\sqrt{1 - \left[\frac{V_{Liq}}{2f\Delta z} \right]^2}} \quad (4)$$

where f is the operating frequency.

2.4 SIMULATION CONDITIONS

Theoretical simulations were carried out in the case of a scanning acoustic microscope in the reflection mode under normal operating conditions: an operating frequency of 140 MHz, a half opening angle of 50° and using the water as the coupling liquid whose density, $\rho = 1000 \text{ kg/m}^3$ and longitudinal velocity $V_L = 1500 \text{ m/s}$.

TABLE 2

calculated z_L liquid longitudinal impedance, z_s liquid transverse impedance of barium lead borosilicate glass $\text{BaO-PbO-20B}_2\text{O}_3\text{-30SiO}_2$

Reflection mode	θ_L	θ_s		
Dose (Gray)	$Z_{Liq}(\text{MKSA})$	$Z_m(\text{MKSA})$	$Z_{Liq}(\text{MKSA})$	$Z_m(\text{MKSA})$
0	1.60672	53.5606	2.018	11.963
3	1.60458	39.1565	2.0021	11.990

6	1.60246	39.6686	1.9750	12.278
9	1.60037	23.5326	1.9411	12.787
12	1.59728	42.7682	1.9161	13.009

3 RESULTS AND DISCUSSION

3.1 GAMMA-IRRADIATION EFFECTS ON $R(\theta)$

It is informative to follow the modify of the reflection coefficient $R(\theta)$ over the whole range of incidence angles for the case of a water-barium lead borosilicate glass interface with several irradiation doses of 0, 3, 6, 9 and 12 Gray shown in Fig. 2 . It should be noted that, $R(\theta)$ is a complex function that admits an amplitude (modulus) $|R(\theta)|$ and phase from Eq. 1. For waves incident on the structure we individually calculate it. At normal incidence, the reflection coefficient value lies between 0 and 1 depending on the acoustic mismatch between the two media. Only the longitudinal wave transmitted and there is no mode conversion, i.e., no shear wave transmitted at normal incidence. As θ increases, longitudinal and shear waves are excited in the solid. $R(\theta)$ stays more or less constant until the longitudinal critical angle, at which point it rises sharply to spike at $|R(\theta)| \equiv 1$. At this angle, the longitudinal wave propagates along the surface so no energy propagated into the solid. The shear wave amplitude goes to zero at this angle and there is total reflection as shown in Fig. 2a. As θ further increases, we get at a second critical angle θ_s for shear waves, which now spread along the surface From θ_s out to 90° there is total reflection of the incident wave, $|R(\theta)| \equiv 1$.

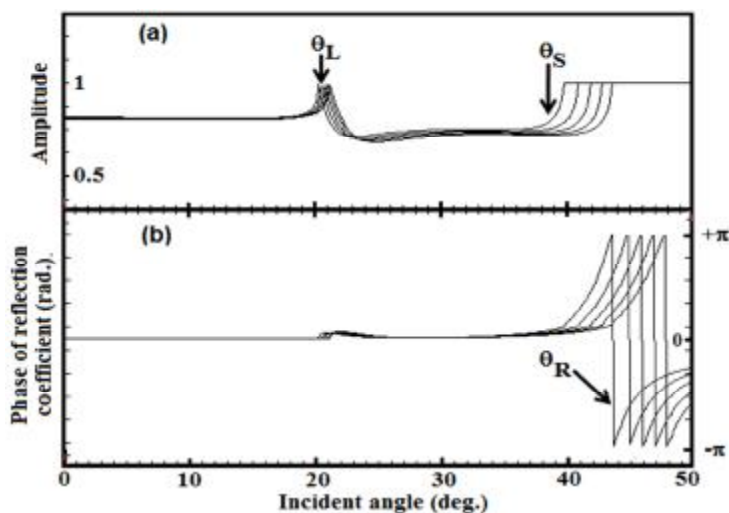


Fig .2.illustrates typical results of the amplitude (Fig. 2a) and the phase (Fig. 2b) as a function of incidence angle.

It is clear that, as the angle of incidence increases we observe important changes in both amplitude and phase. It can readily be deduced that shear modes are excited at $\theta_S \sim 42^\circ, 41.5^\circ, 40.6^\circ, 39.4^\circ$ and 38.5° for Gamma irradiated dose rate of 0 , 3, 6, 9, and 12 respectively. In phase, the most important variation, with $\Delta\phi = 2\pi$, occurs at the critical angle, θ_R , at which Rayleigh modes are excited. Thus, one can simply determine that $\theta_R \sim 47.5^\circ, 46.7^\circ, 45.7^\circ, 44.6^\circ$ and 43.4° for Gama irradiated dose rate of 0 , 3, 6, 9, and 12 respectively. Moreover, it can be seen visibly longitudinal modes θ_L variation from 21° to 20.1° . It should be noted that the onset of the 2π phase change corresponds to the shear critical angle θ_S , (as indicated by the arrow in Fig. 2b). The slight shift between θ_S and θ_R is due to the fact that the Rayleigh velocity varies slightly from 87 to 95 % of the shear velocity [14]. The degree fluctuations in phase and amplitude in R (θ) in the different Gama irradiated dose rate of each critical angle are indicative of the generation efficiency of different modes.

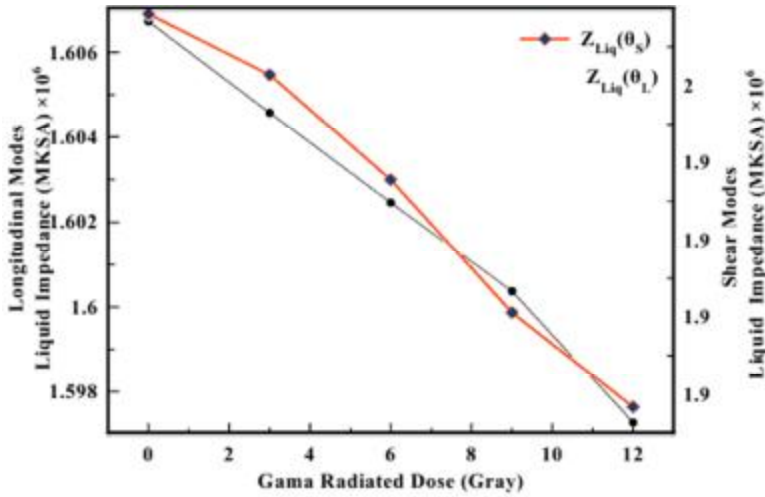


Fig 3 variations of longitudinal and shear liquid impedance with gamma irradiated dose rate.

3.2 GAMMA-IRRADIATION EFFECTS ON ACOUSTIC SIGNATURE $V(z)$

Acoustic signatures, or $V(z)$, can be either measured experimentally or determined theoretically. In the present investigation, we considered the latter case via the application of Eq. 5 deduced by the angular spectrum model [18].

In Fig. 4, we illustrate the calculated acoustic signatures for a 50° lens opening angle, a frequency of 140 MHz and water coupling. It can be seen that there are strong oscillations, where a series of periodic maxima and minima occurs, characterized by a period $\Delta(z)$. This region is characteristic of the sample's acoustic properties. The patterns vary with the material doping, as do the depths of the minima and the relative magnitude of the maxima which on Ag doping as well.

Acoustic materials signatures, $V(z)$, are the most important parameter that can be experimentally measured by a scanning acoustic microscope. Using equation (1) and previously determined the curves of (Fig. 2a and Fig. 2b), we deduced the acoustic signatures that are illustrated in Fig.4. It can clearly be seen that all the curves exhibit a series of regular periodical oscillations due to constructive and destructive interference between different propagating modes in different Gama irradiated dose rate. However, a close look show that as the Gama irradiated dose rate increases we notice a change in $V(z)$ amplitudes as well as in periods. Moreover, The difference between two