

Image Article

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# Fourier Transform Infrared (FTIR) Spectroscopy, Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) Spectroscopy, Micro-Attenuated Total Reflectance Fourier Transform Infrared (Micro-ATR-FTIR) Spectroscopy, Macro-Attenuated Total Reflectance Fourier Transform Infrared (Macro-ATR-FTIR) Spectroscopy, Two-Dimensional Infrared Correlation Spectroscopy, Linear Two-Dimensional Infrared Spectroscopy, Non-Linear Two-Dimensional Infrared Spectroscopy, Atomic Force Microscopy Based Infrared (AFM-IR) Spectroscopy, Infrared Photodissociation Spectroscopy, Infrared Correlation Table Spectroscopy, Near-Infrared Spectroscopy (NIRS), Mid-Infrared Spectroscopy (MIRS), Nuclear Resonance Vibrational Spectroscopy, Thermal Infrared Spectroscopy and Photothermal Infrared Spectroscopy Comparative Study on Malignant and Benign Human Cancer Cells and Tissues under Synchrotron Radiation with the Passage of Time



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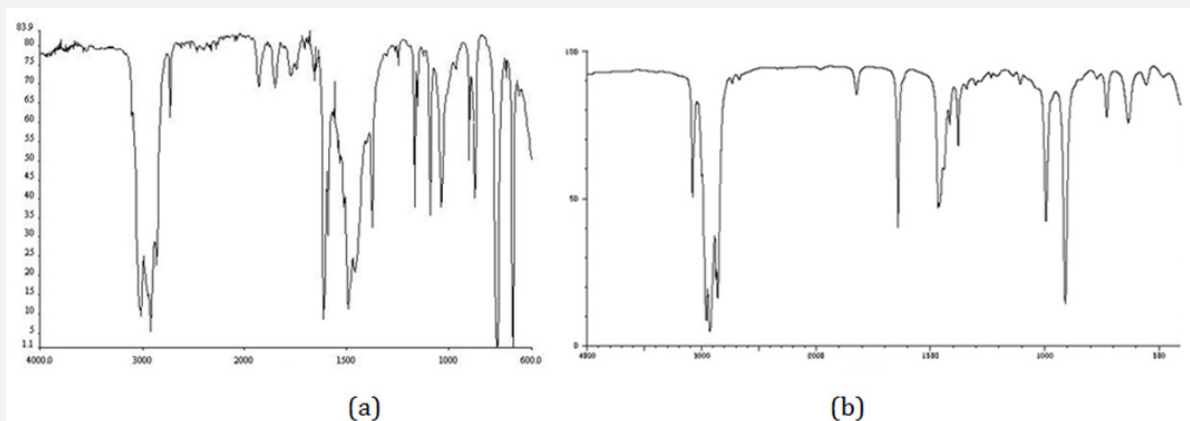
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**Abbreviations:** FTIR : Fourier Transform Infrared; ATR-FTIR: Attenuated Total Reflectance Fourier Transform Infrared; Micro-ATR-FTIR: Micro-Attenuated Total Reflectance Fourier Transform Infrared; Macro-ATR-FTIR: Macro-Attenuated Total Reflectance Fourier Transform Infrared; AFM-IR: Atomic Force Microscopy Based Infrared; NIRS: Near-Infrared Spectroscopy; MIRS: Mid-Infrared Spectroscopy

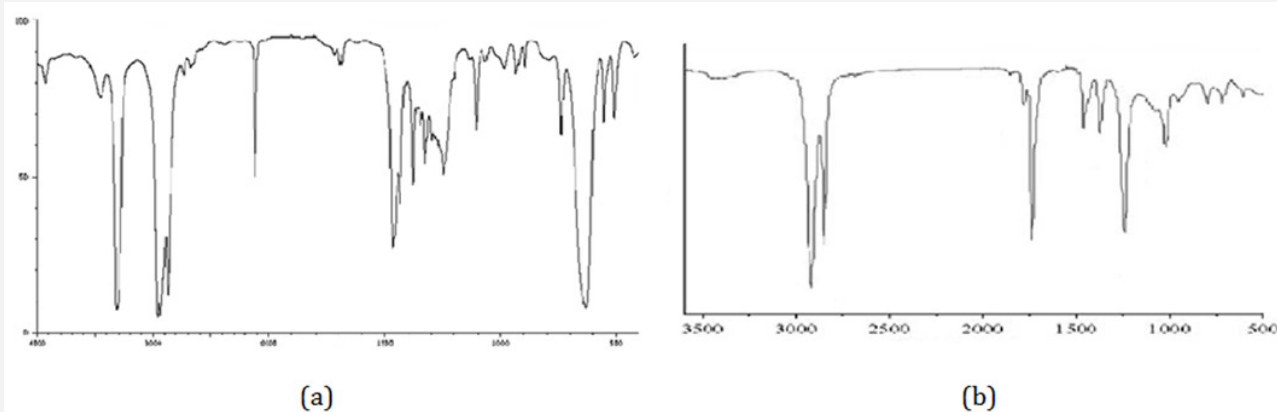
## Introduction

In the current study, we have experimentally and comparatively investigated and compared malignant human cancer cells and tissues before and after irradiating of synchrotron radiation using Fourier Transform Infrared (FTIR) Spectroscopy, Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) Spectroscopy, Micro-Attenuated Total Reflectance Fourier Transform Infrared (Micro-ATR-FTIR) Spectroscopy, Macro-Attenuated Total Reflectance Fourier Transform Infrared (Macro-ATR-FTIR) Spectroscopy, Two-Dimensional Infrared Correlation Spectroscopy, Linear Two-Dimensional Infrared Spectroscopy,

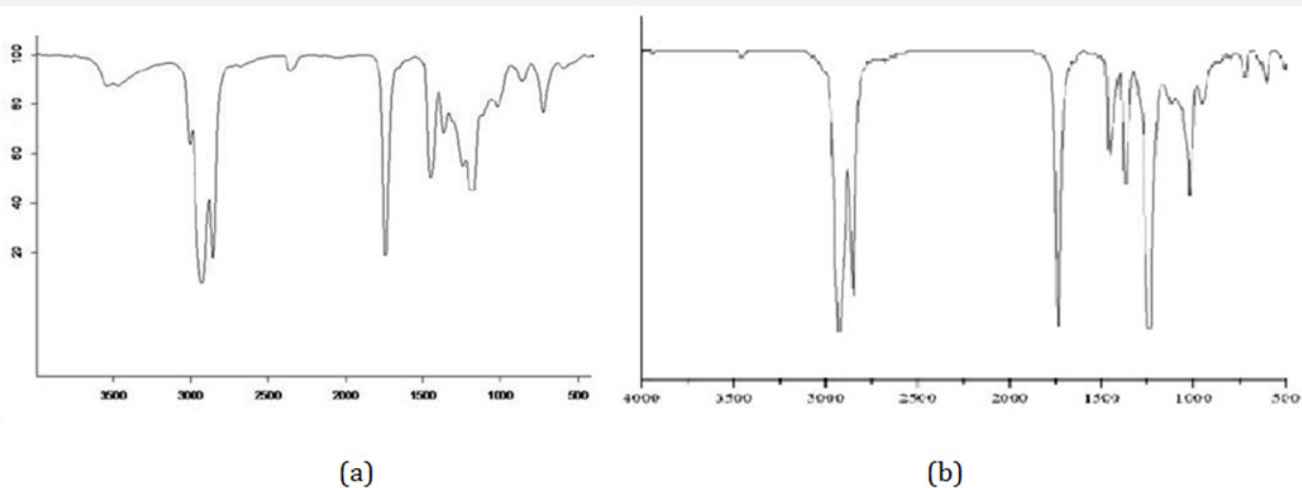
Non-Linear Two-Dimensional Infrared Spectroscopy, Atomic Force Microscopy Based Infrared (AFM-IR) Spectroscopy, Infrared Photodissociation Spectroscopy, Infrared Correlation Table Spectroscopy, Near-Infrared Spectroscopy (NIRS), Mid-Infrared Spectroscopy (MIRS), Nuclear Resonance Vibration Spectroscopy, Thermal Infrared Spectroscopy and Photothermal Infrared Spectroscopy. It is clear that malignant human cancer cells and tissues have gradually transformed to benign human cancer cells and tissues under synchrotron radiation with the passage of time (Figures 1-7) [1-75].



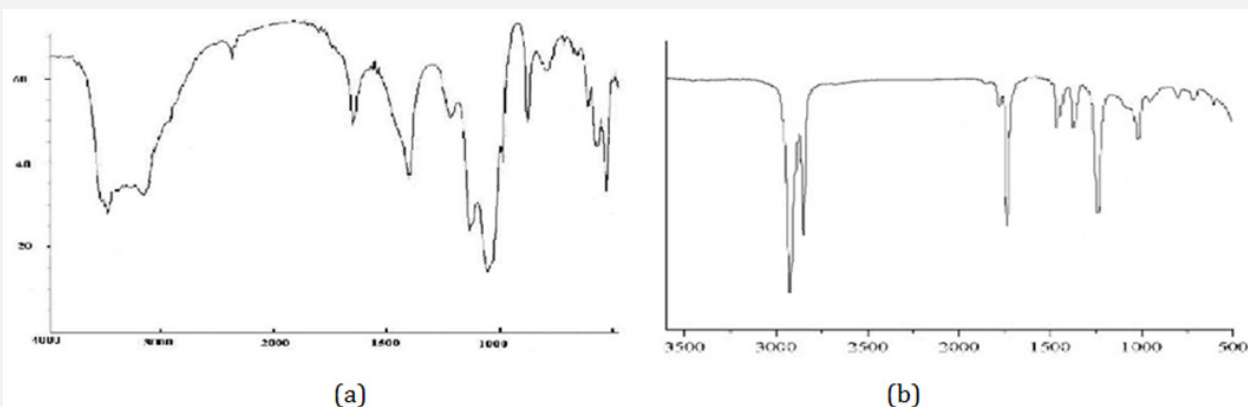
**Figure 1:** Fourier Transform Infrared (FTIR) Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



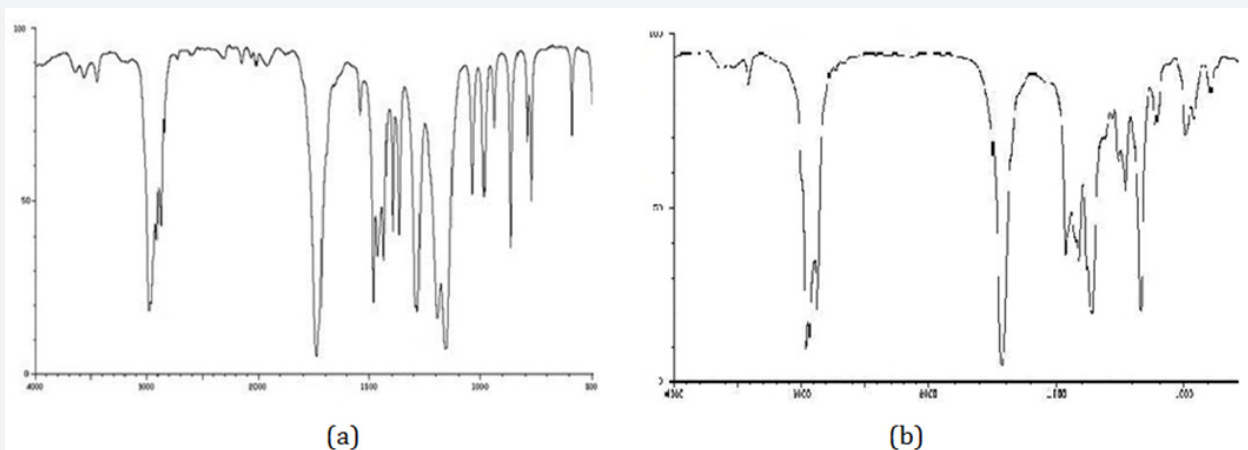
**Figure 2:** Attenuated Total Reflectance Fourier Transform Infrared (ATR-FTIR) Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



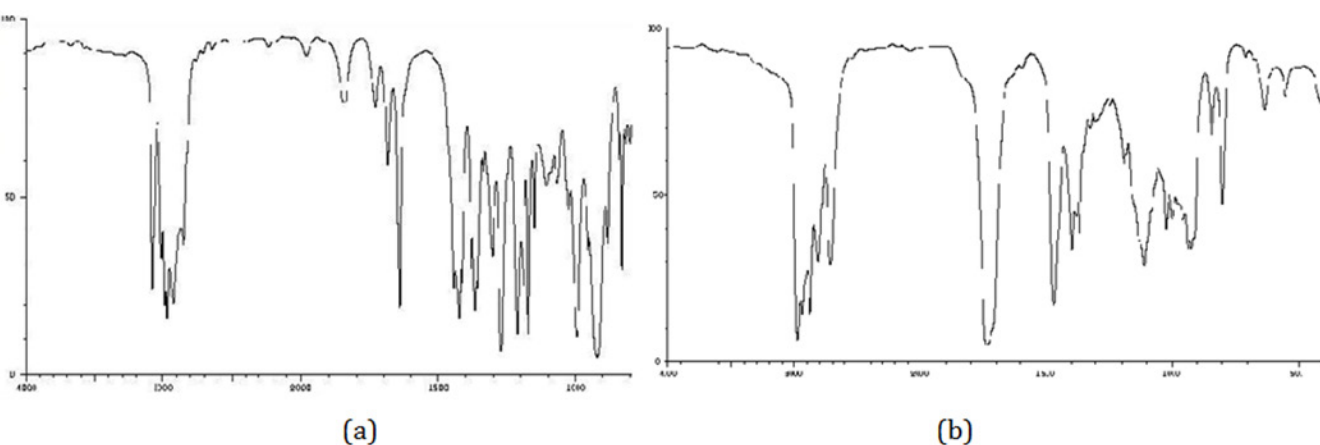
**Figure 3:** Micro-Attenuated Total Reflectance Fourier Transform Infrared (Micro-ATR-FTIR) Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



**Figure 4:** Macro-Attenuated Total Reflectance Fourier Transform Infrared (Macro-ATR-FTIR) Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



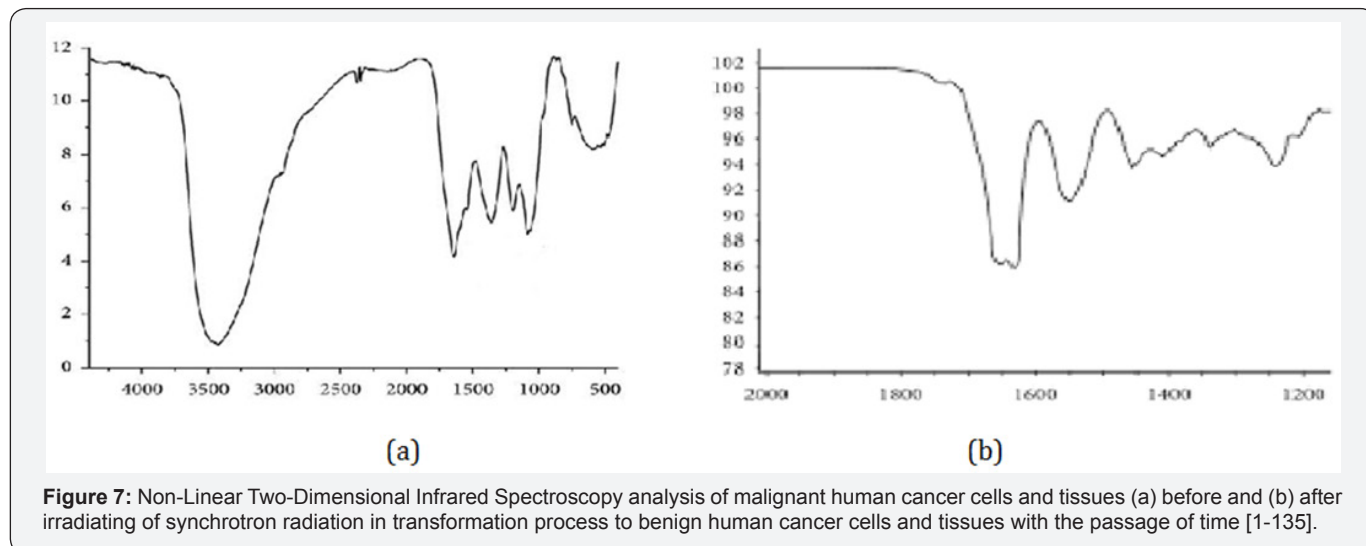
**Figure 5:** Two-Dimensional Infrared Correlation Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



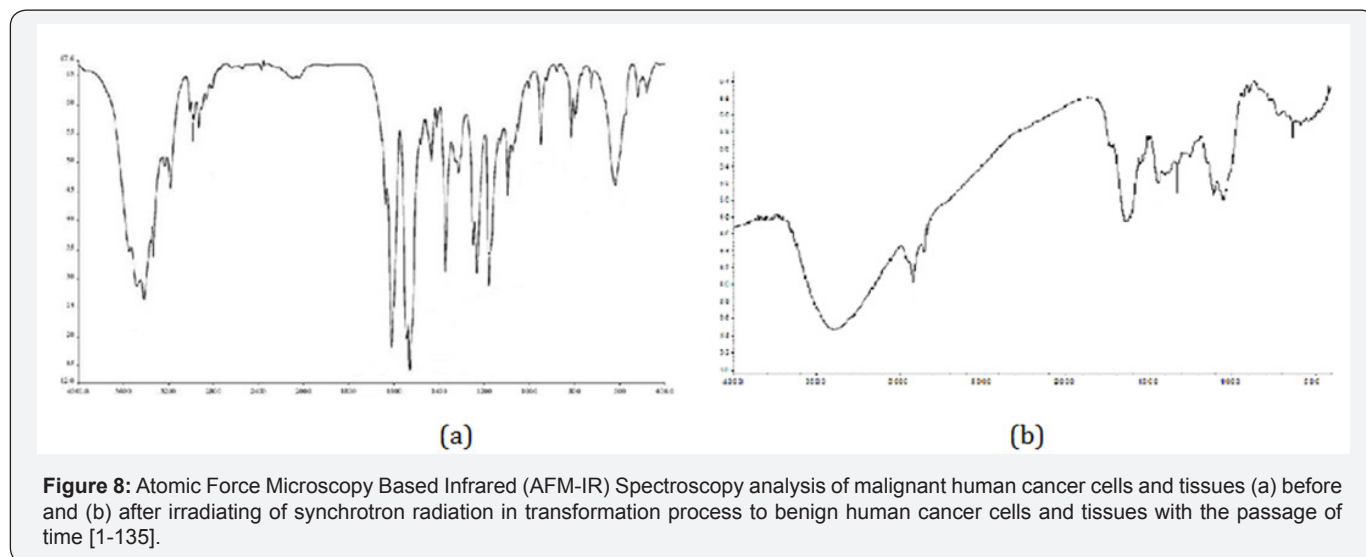
**Figure 6:** Linear Two-Dimensional Infrared Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].

It can be concluded that malignant human cancer cells and tissues have gradually transformed to benign human cancer cells

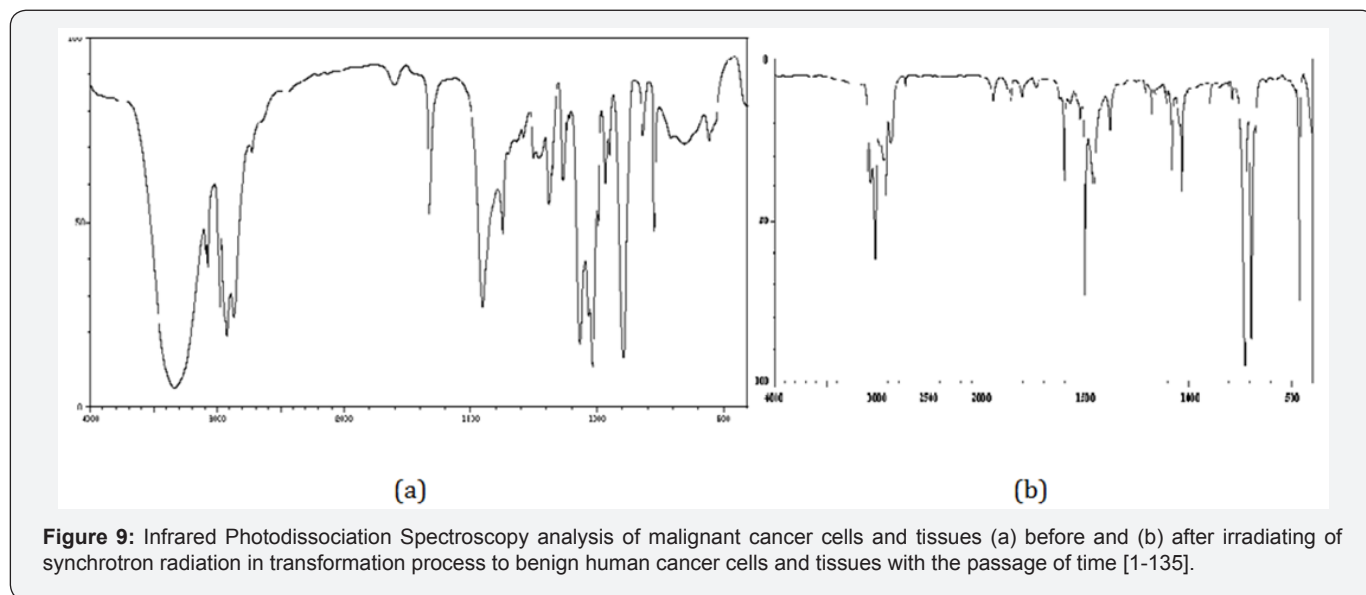
and tissues under synchrotron radiation with the passage of time Figures 8-15 [76-135].



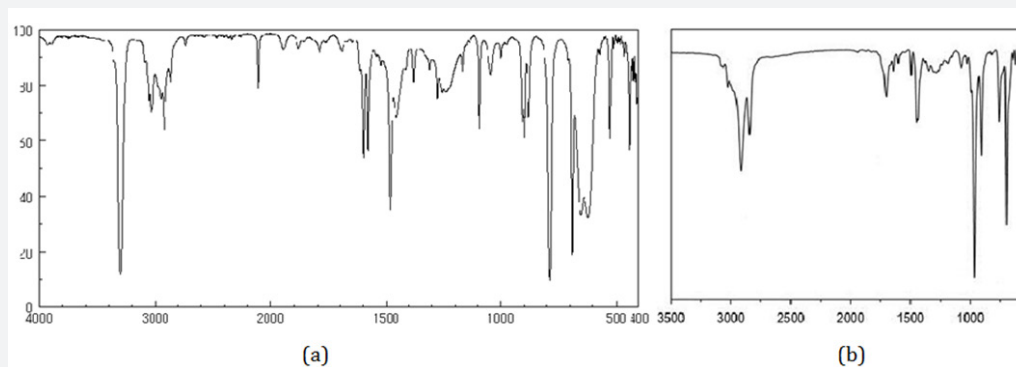
**Figure 7:** Non-Linear Two-Dimensional Infrared Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



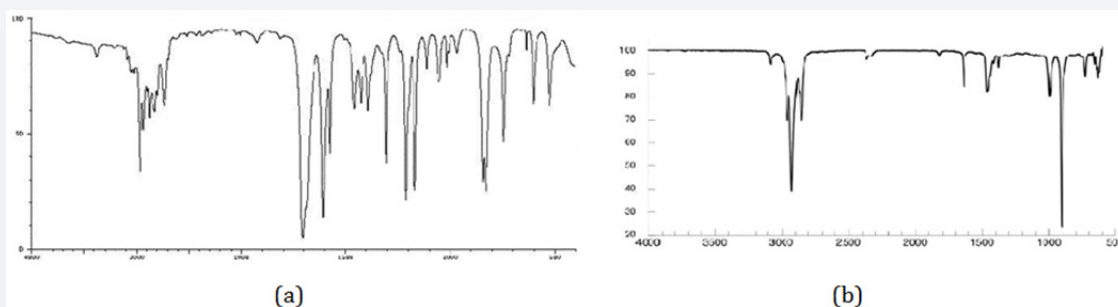
**Figure 8:** Atomic Force Microscopy Based Infrared (AFM-IR) Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



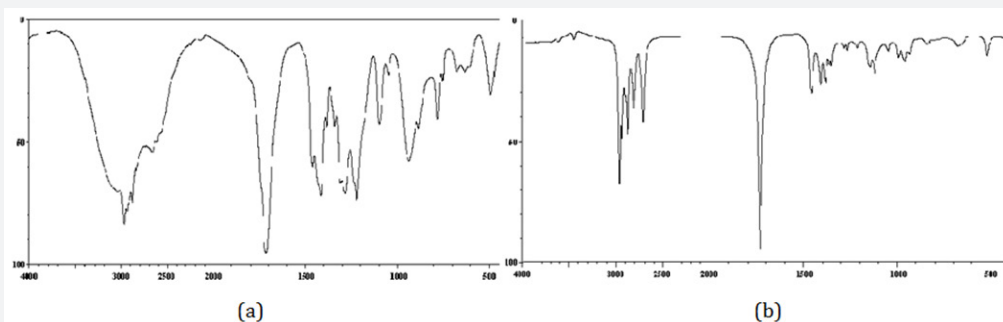
**Figure 9:** Infrared Photodissociation Spectroscopy analysis of malignant cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



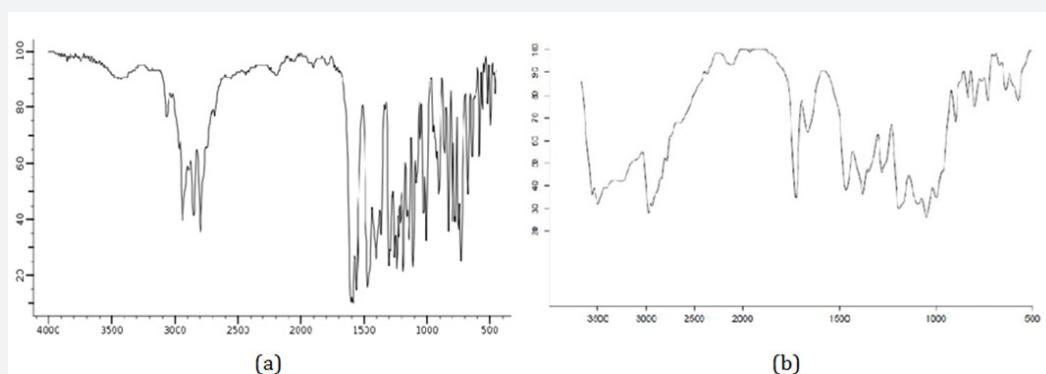
**Figure 10:** Infrared Correlation Table Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



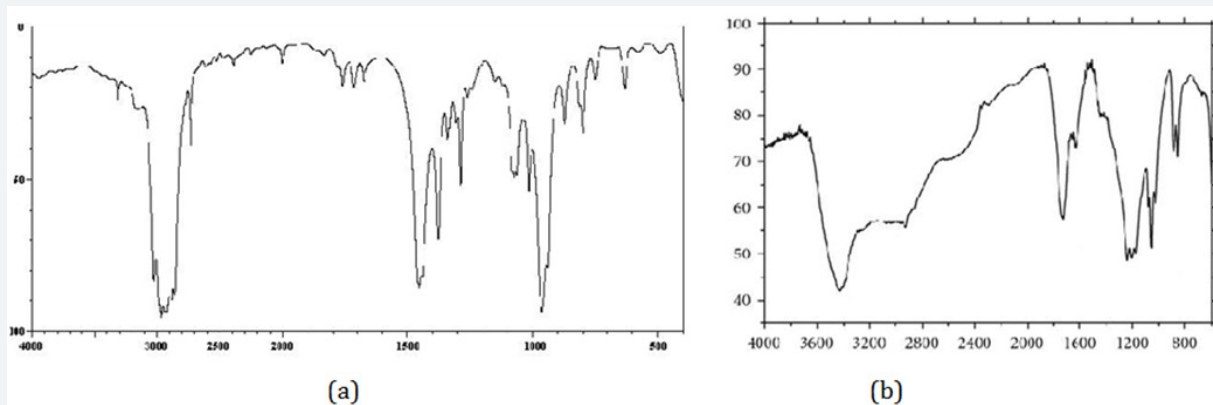
**Figure 11:** Near-Infrared Spectroscopy (NIRS) analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



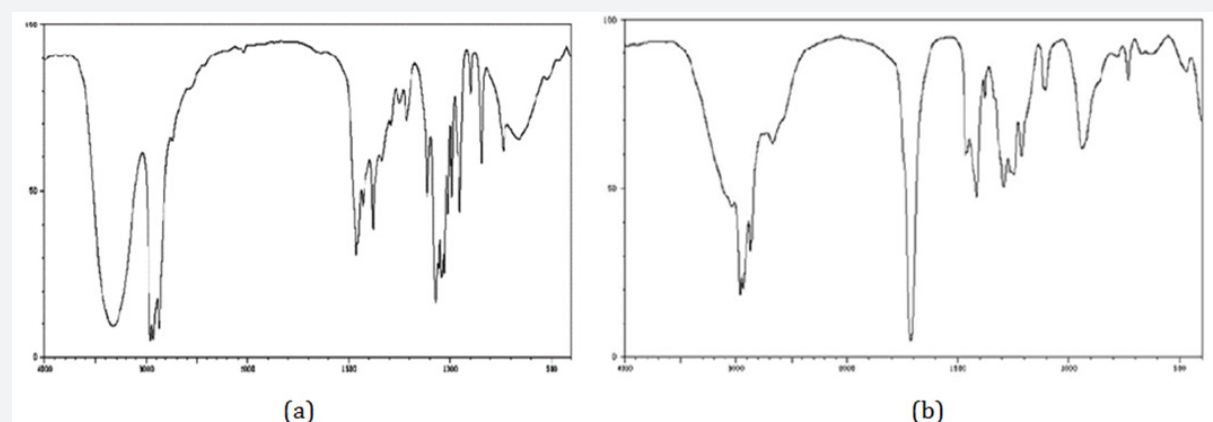
**Figure 12:** Mid-Infrared Spectroscopy (MIRS) analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



**Figure 13:** Nuclear Resonance Vibrational Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



**Figure 14:** Thermal Infrared Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].



**Figure 15:** Photo-thermal Infrared Spectroscopy analysis of malignant human cancer cells and tissues (a) before and (b) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time [1-135].

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