

# Atomic force microscopy based infrared (AFM-IR) spectroscopy and nuclear resonance vibrational spectroscopy comparative study on malignant and benign human cancer cells and tissues under synchrotron radiation with the passage of time

## Image 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 Atomic Force Microscopy Based Infrared (AFM-IR) Spectroscopy and Nuclear Resonance Vibrational 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 & 2).<sup>1-145</sup> It should be noted that malignant human cancer cells and tissues were exposed under white synchrotron radiation for 30 days. Furthermore, there is a shift of the spectrum in all of spectra after irradiating of synchrotron radiation that it is because of the malignant human cancer cells and tissues shrink post white synchrotron irradiation with the passage of time. In addition, all of the figures are related to the same human cancer cells and tissues. Moreover, in all of the figures y-axis shows intensity and also x-axis shows energy (keV) (Figures 1 & 2).<sup>101-145</sup>

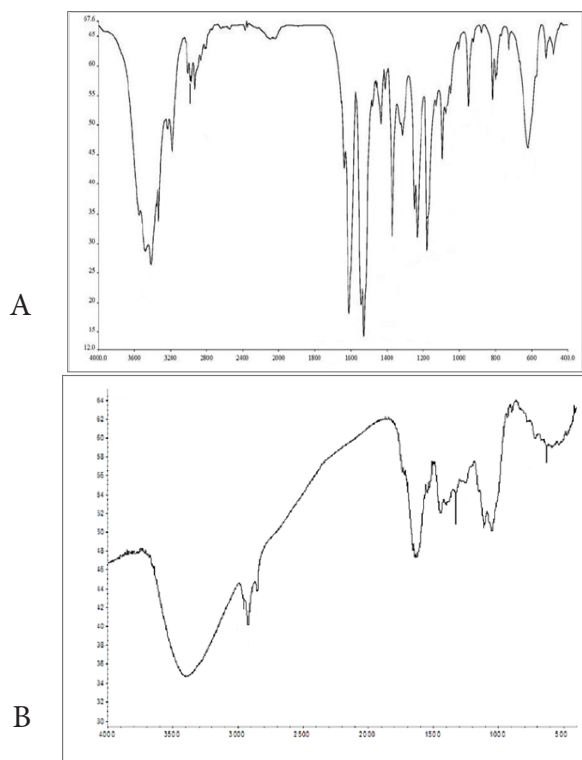
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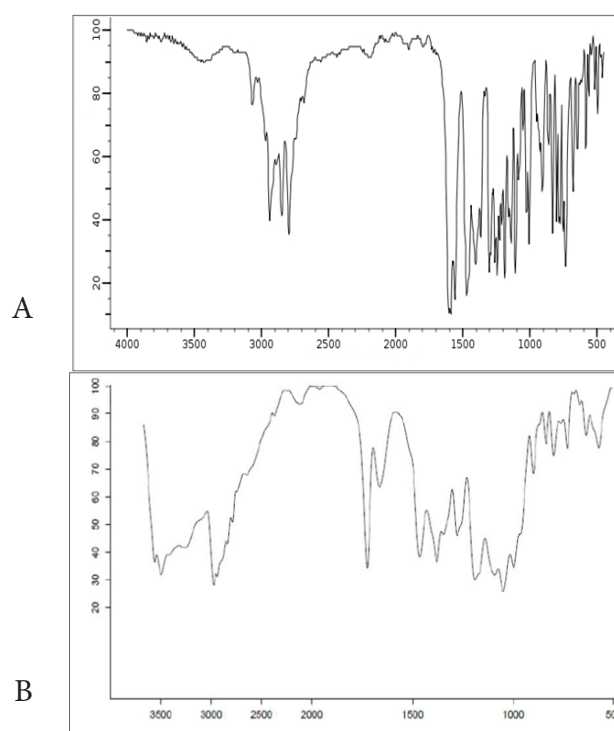
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**Figure 1** Atomic force microscopy based infrared (AFM-IR) Spectroscopy analysis of malignant human cancer cells and tissues (A) before and (B) after irradiating of synchrotron radiation in transformation process to benign human cancer cells and tissues with the passage of time.<sup>1-145</sup>



**Figure 2** 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.<sup>1-145</sup>

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 1 & 2).<sup>1-145</sup> It should be noted that malignant human cancer cells and tissues were exposed under white synchrotron radiation for 30 days.

Furthermore, there is a shift of the spectrum in all of spectra after irradiating of synchrotron radiation that it is because of the malignant human cancer cells and tissues shrink post white synchrotron irradiation with the passage of time. In addition, all of the figures are related to the same human cancer cells and tissues. Moreover, in all of the figures y-axis shows intensity and also x-axis shows energy (keV) (Figures 1 & 2).<sup>101-145</sup>

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## Conflict of interest

The authors declare that there is no conflict of interest.

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