# Identification the Spectrum Variations in Mammalian Tissues by Synchrotron Radiation Fourier Transform Infrared Microscopy

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Synchrotron radiation Fourier-transform infrared (SR-FTIR) spectroscopy can be used to biological sample by detecting the characteristic absorption bands originating from all bio-molecules it contains, such as proteins, lipids, nucleic acids, and others. Since the combination of molecular parameters is unique in a specific tissue structure, cell type, or part of a cell, FTIR spectroscopy is capable of characterizing distinct tissue structures and provides molecular information on biological and medical research, such as structure alteration, bio-molecule modification and cancer progression.

FTIR spectra of tissue specimens, such as kidney and liver, were collected by using SR-FTIR (Thermo Nicolet, Magna-IR spectrometer) on BL14A, NSRRC. The spectra measured from normal kidney tissue to glomerule tissue reveal significant differences in the absorbance at range from 1224 to 1080 $cm^{-1}$ ($v_{as}PO_2^-$ and $v_sPO_2^-$) and 1641$cm^{-1}$ (Amide I) to 1539 $cm^{-1}$ (Amide II) in the glomerule region. The functional maps of characteristic bands of amide I, amide II, $v_{as}PO_2^-$ and $v_sPO_2^-$ group were taken from kidney tissue to glomerule tissue also demonstrated that the glomerule has the higher $v_sPO_2^-$ than the other part.

On the other hand, lung tissue specimens including normal and cancerous regions were measured. In order to compare their spectra variations, we collect spectra from tumor region, normal and tumor boundary, normal region near tumor as well as normal region. The result reveals that the Amide I peak in normal region exhibits a red shift (1630 $cm^{-1}$) compared to that in cancerous region (1650 $cm^{-1}$). Taken these together, FTIR might serve as an important diagnostic tool and the spectra variations form tissues could provide as an index of disease progression.

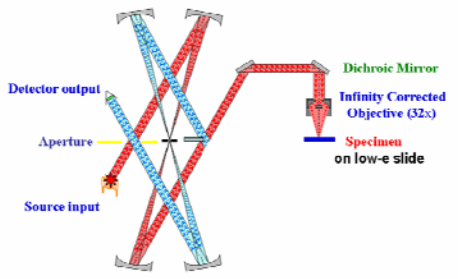


**Figure 1.** Ray diagram of reflectance IR confocal microscope.

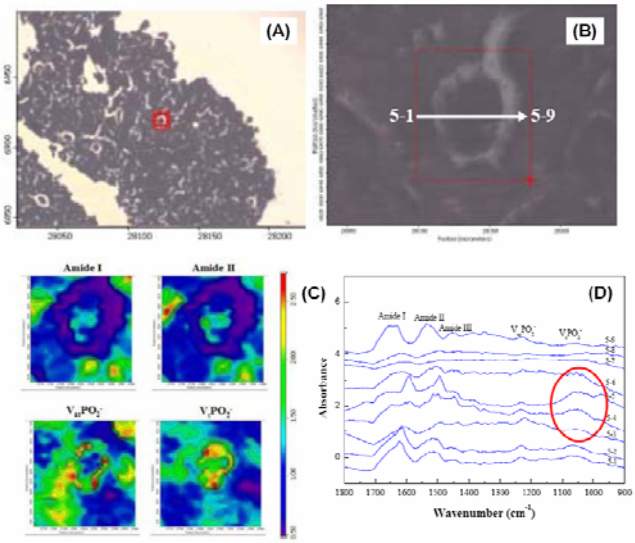


**Figure 2.** The observation of kidney tissue by SR-FTIR spectroscopy. (A) Low- and (B) high-fold magnified images of glomerule in kidney tissue that observed under optical microscopy. (C) The maps of the functional groups map in kidney tissue. (D) The FTIR spectra of kidney tissue that pointed at figure 2B.

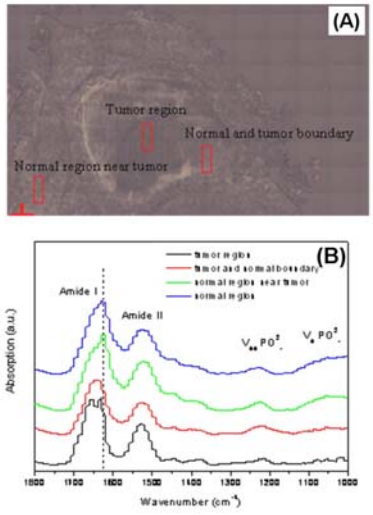


**Figure 3.** Peak shift between normal and cancerous regions of lung tissue. (A) Optical images of the indicated regions in lung tissue. (B) The FTIR spectra from tumor region; normal and tumor boundary; normal region near tumor; and normal region, respectively.