SYNCHROTRON-BASED HIGHEST RESOLUTION FTIR SPECTROSCOPY OF AZULENE, NAPHTHALENE ($C_{10}H_8$), INDOLE (C_8H_6N) AND BIPHENYL ($C_{12}H_{10}$)

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Great progress has been made in resolution ($\Delta\nu \leq 20$ MHz) and sensitivity in the field of high resolution Fourier transform infrared (FTIR) spectroscopy over the last decade[a,b,c]. In particular, the use of synchrotron sources such as the Swiss Light Source (SLS)[d] have overcome one of the disadvantages of high resolution FTIR spectroscopy, the problem of noise related to modest signal strength with broad band coverage from weak light sources. FTIR spectroscopy with synchrotron sources now makes it possible to investigate scientific questions of fundamental physics and astrophysics. One of the great challenges of astronomical infrared spectroscopy is the identification of the Unidentified Infrared Bands (UIBs) found in several interstellar objects. Polycyclic Aromatic Hydrocarbons (PAHs) have been proposed to be the carrier of the UIBs[e]. For that reason we have started to investigate with our ETH-SLS interferometer the rotationally resolved FTIR spectra of the bicyclic molecules naphthalene ($C_{10}H_8$)[d] and azulene ($C_{10}H_8$) as a simple prototypical spectrum for a PAH infrared spectrum and of indole (C_8H_6N) as a prototype of a bicyclic heteroaromatic system. We have analysed in high resolution the ν_{46} band of naphthalene, the ν_{35} and $2\nu_{40}$ bands of indole as well as the ν_{44} band of azulene. We have found a coincidence between the ν_{46} fundamental of naphthalene and the UIB at 12.78 μm. A comparison of the biphenyl FTIR spectrum with the UIBs in the range 13 to 15 μm illustrates a coincidence between the UIBs at 13.6 μm and 14.2 μm with the major biphenyl bands.

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[e] A.G.G.M. Tielens, *Annu. Rev. Astron. Astrophys.* **2008**, *46*, 289.