FLUORESCENCE EXCITATION, EMISSION, AND SYNCHRONOUS SPECTRA AT LOW TEMPERATURES

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Computer deconvolution of experimental excitation and emission fluorescence bands is presented and used to generate synchronous spectra. The computer simulation successfully predicts the number of synchronous fluorescence (SF) bands, band shapes, and band maximum wavelengths for any constant wavelength difference ($\Delta\lambda$). To test the simulation, emission, excitation, and synchronous spectra were obtained for anthracene in n-hexane. Excellent agreement is obtained reproducing and finding the origin of the experimental SF bands for values of $\Delta\lambda$ between 2 and 100. The excitation, emission, and synchronous ($\Delta\lambda$=10) spectra of toluene, aniline, naphthalene, acenaphthene, pyrene, and anthracene are obtained. The synchronous spectrum ($\Delta\lambda$=10) of the same mixture is presented and assigned based on the synchronous bands of the individual compounds. The synchronous fluorescence technique and the computer simulation method are proposed to complement other techniques in the analysis of fluorescent samples from comets, as well as in missions to planets and satellites of the solar system. With our experimental set-up we will be able to obtain spectra for temperatures between 77 K and 298 K. Our laboratory is currently obtaining excitation, emission, and synchronous spectra of PAHs at temperatures that could be found on the surface of Titan and Mars.