Invited lecture

IR photoacoustic spectroscopy – a tool for catalysts characterization

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The analysis of solid samples can often be a difficult problem for the researchers dealing with infrared (IR) spectroscopy. In conventional absorption spectroscopy the measurement of absorption is transferred to that of the radiation transmitted through the sample. Three methods stand out as being more suitable for studying solid materials. These methods are: diffuse reflectance (DR), photoacoustic spectroscopy (PAS), and Fourier transform (FT) Raman. All three methods require little or no sample preparation, and therefore are ideal for the samples that may change during the preparation as mineral oil mulls or KBr disks. In the case of PAS, the adsorbed radiation is determined directly via its heat and hence the sound produced in the sample. Fourier transform infrared PAS (FT-IR/PAS) is one of the main IR techniques which can be successfully applied in catalysis and surface science research. Some examples of this spectroscopic technique application will be presented [1–5].

Photoacoustic (PA) measurements are unique in that they depend directly on the energy absorbed by the sample, rather than on what is transmitted or reflected [1–3]. Electromagnetic radiation absorbed in a sample excites ground state molecules to higher energy levels. The excited states relax either radiatively or nonradiatively (Fig. 1) [4].

![Fig. 1. Thermal effects due to light interaction with the studied sample [4].](image)

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References