IR spectroscopy of H2O, CO2 and CO confined in nanoporous silica aerogel

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The influence of nanoconfinement on the absorption spectra of gases attracts the growing attention of researchers. In nanopourous materials the molecules of investigated matter can be adsorbed by internal surface or be found in gas phase. Small sizes of the pores of the nano-structure materials give us a unique possibility to study the absorption spectra of gases under unusual condition - strong limitation of the mean free path of the molecules. Under this condition, the line shape and its width and shift are predominantly determined by the collision of molecules with the nanopores walls rather than with each other [1-3]. The information obtained from studying absorption spectra under such condition is very important for understanding the processes of gas-surface interaction and pore sizes determination [3].

In this work we report on the study of absorption spectra of the H_2O, CO_2 and CO confined in nanoporous silica aerogel. This material has a high transparency in near IR and visible range [4].

The absorption spectra of H_2O, CO_2 and CO were recorded using Bruker IFS 125 HR Fourier spectrometer in the 4000 – 5500 cm^{-1} region, at room temperature and at resolution of 0.03 cm^{-1}. Strong line broadening and shift were observed for all confined gases, in comparison with usual conditions. The analysis and comparison of obtained spectral parameters of absorption lines have been performed.

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