INDUCED INFRARED ABSORPTION OF H_2 IN SOLID C_{60}

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We use infrared spectroscopy to observe the quantum dynamics of molecular hydrogen trapped within the interstitial sites of the C_{60} lattice. These spectra form the first observation of infrared activity induced by the C_{60} intermolecular potential. They also reveal the first evidence for distinct side-bands (at +/- 127 cm^{-1}) associated
with the translational motion of the trapped species. On exposure of C_{60} to high pressure H_2 the induced modes grow in intensity over the course of a few hours as the H_2 slowly diffuses into the octahedral interstitial sites. Despite the fact that the fundamental H_2 vibrational mode occurs highly red-shifted (54 cm^{-1}) relative to the gas phase the location of the rotatioanal side-bands indicates almost complete rotational freedom of the trapped H_2. Most surprisingly the spectra contain weak central zero-phonon modes which should not be activated by a potential with true octahedral symmetry. These zero-phonon modes show a sudden decrease in intensity on cooling through the C_{60} orientational phase transition at 260 K. We speculate that this may be the result of freezing out of a quasi fluid like surface layer within the C_{60} lattice.
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