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Temperature dependence of Raman spectroscopy of molecular iodine trapped in zeolite crystals WENHAO GUO, DINGDI WANG, JUANMEI HU, ZIKANG TANG, SHENGWANG DU, Physics Department, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon, Hong Kong — Molecular iodine has been pursued for many practical applications, such as molecular clock, molecule-based quantum information processing, due to its narrow-linewidth hyperfine optical transitions. But because of its low vapor pressure, the experimental setup employing a free-space-based iodine vapor cell is very space-consuming. Recently, it is reported that the iodine molecule can be loaded into the channels of zeolite crystals, the density there could be orders improved and its space orientation can be precisely controlled. It may drastically reduce the size of molecular iodine experiment setup, and have many potential applications in microchip technology. We have studied the Raman spectroscopy of iodine molecule confined in zeolite crystals, AlPO4-5 (AFI) and AlPO4-11 (AEL), under different temperatures. The results show that in AEL, where the molecules are intensely confined, the ground vibrational states are close to that of an ideal 1D harmonic oscillator, while in AFI, where the molecules have a bit more freedom, they vibrate like in the free space, but with a loosened spring. And we come up a reasonable theoretical model to explain the Raman width dependence on temperature for these systems

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