Structural phase Transition of Low-coverage Pentacene on SiO_2 and Au surfaces

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Thermodynamic behaviors of low-coverage pentacene molecules on both silicon oxide (SiO_2) and gold (Au) surfaces have been observed via x-ray absorption spectroscopy. It reveals intriguing structural transitions with temperature: For the SiO_2 surface, monotonic decrease in the mean tilt angle of the pentacene layer is observed as the temperature is increased. For the Au surface, three different structural regimes are found, indicating double transitions. Such contrasting thermodynamic behaviors are explained in terms of a spin-1 Ising model, which includes three structural states: standing-up, lying-down, and desorbed.