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Scanning Tunneling Microscopy Investigation of Ordered Iron Phthalocyanine Molecules on Ag(111) KEN PARK, KEDAR MANANDHAR, Baylor University, S. MA, JAN HRBEK, Brookhaven National Laboratory — A well-ordered, molecular thin films (about 0.5 monolayers) of iron phthalocyanine (FePc) on Ag(111) has been investigated using a scanning tunneling microscopy. The room temperature deposition, followed by 30 minutes of annealing up to 475 K results in well-ordered islands of FePc molecules which form a two-dimensional, oblique lattice. The overlayer lattice vectors $\mathbf{a}_1$ and $\mathbf{b}_1$are 16.2 Å each with the angle of 80 $^\circ$ between the lattice vectors. The FePc overlayer lattice is commensurate to the substrate lattice with the relationship of $\mathbf{a}_1 = 6\mathbf{a}$ - $\mathbf{b}$ and $\mathbf{b}_1 =$ -$\mathbf{a}$ + $6\mathbf{b}$, with $\mathbf{a}$ and $\mathbf{b}$ are the Ag(111) lattice vectors. Furthermore, FePc molecules at the opposite corners within the unit cell align their isoindole rings at each other, significantly increasing the nearest and the next-nearest neighbor distances in the overlayer. The commensurate overlayer lattice structure and the distinct molecular orientation within the unit cell are attributed to the molecule-surface interaction via the Fe $3d_{xz,yz}$ and Ag $4d_{xz,yz}$ orbitals.

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