

## Thickness dependence of the LUMO position for phthalocyanines on hydrogen passivated silicon (1 1 1)

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Available online 9 July 2004.

### Abstract

Inverse photoemission spectroscopy (IPES) was employed to study the density of unoccupied electronic states of fluorinated and non-fluorinated copper phthalocyanine layers deposited onto hydrogen passivated Si(1 1 1) substrates. For the non-fluorinated copper phthalocyanine (CuPc) the lowest unoccupied molecular orbital (LUMO) is found to shift gradually towards the Fermi level with increasing film thickness. The shift amounts to 400 meV and appears for film thicknesses between one monolayer and 10 nm. This finding complements previous results obtained using ultraviolet photoemission spectroscopy where the highest occupied molecular orbital (HOMO) was found to shift as a function of film thickness. Fluorinated copper phthalocyanine (F<sub>16</sub>CuPc) shows the opposite behaviour, that is the distance between LUMO and Fermi level is increasing by 1.2 eV.

**Author Keywords:** Copper phthalocyanine; Fluorinated copper phthalocyanine; Inverse photoemission; LUMO

79.20.Kz; 71.20.Rv



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