2D PHASE TRANSITION OF ORGANIC MOLECULAR LAYERS REVEALED BY OPTICAL ANISOTROPY

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Molecular interactions on solid surfaces play a key role in the formation of organic-inorganic interfaces and thus strongly influence the properties of organic thin films. Studying two dimensional (2D) phase transitions of ultra thin organic layers allows a quantitative evaluation of this important interaction.

Here, we present the result of our study on the adsorption of pentacene and perfluoropentacene molecules on Cu(110)-(2x1)O using reflectance difference spectroscopy (RDS) \cite{1}, \cite{2}. For both systems, we have observed a 2D gas-solid phase transition indicated by a reversible variation of the anisotropy of the optical signals contributed by the intramolecular electronic transitions. The observation is attributed to an azimuthal reorientation of the organic molecules upon 2D phase transition. Detailed studies on the variation of optical anisotropy as a function of coverage and substrate temperature allow us to extract the corresponding 2D heat of condensation of the adlayer which is a measure of the lateral molecular interaction \cite{3}.

As demonstrated in this study, monitoring the optical changes upon 2D phase transitions can provide direct access to critical quantities and, hence, further insight into molecular interactions at organic-inorganic interfaces.

Keywords: Optical anisotropy; Organic molecular layer; Phase transition

References