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LNF-87/67

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Estratto da:
SIF - Conf. Proc. "Synchrotron Radiation at Frascati" Vol. 5, 221 (1986)

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P.O. Box, 13 - 00044 Frascati (Italy)

**TEMPERATURE-DEPENDENT ADSORPTION OF ORGANIC MOLECULES
ON Si(III)2x1 IN THE RANGE 140-300°K**

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In the general frame of a systematic investigation on the interaction of organic molecules with semiconductor surfaces, we studied the temperature-dependent adsorption of thiophene, C_4H_4S , and pyridine, C_5H_5N on Si(III)2x1 by synchrotron-radiation-excited photoemission, using the vacuum ultraviolet beam line of the "PULS" facility at the Frascati National Laboratories of the INFN.

Recent HREELS measurements⁽¹⁾ revealed 2 different adsorption states of thiophene on Si(III)2x1 at low temperatures, depending on exposure: i) direct interaction of thiophene with Si atoms (1-20L); ii) formation of a multilayer of thiophene on the surface (30-200L). At $T > 270^\circ K$ thiophene decomposes losing the S atom while the C_4H_4 residual chain directly links with one or more Si atoms in cyclic structures. Present photoemission measurements have confirmed and completed the above reported results.

We report in Fig. 1 a Si(III)2x1 spectrum taken at 150°K (1a) and spectrum of thiophene adsorbed on Si(III)2x1 in the following conditions: 1b) $T=150^\circ K$, exposure 5L; 1c) $T=150^\circ K$, 200L; 1d) $T=300^\circ K$, 50L. 5 structures are evident in Fig. 1b) at -2.6, -6.1, -10.8, -15.6 and -19.4 eV from the top of the VB. With reference to Fig. 1a) and to the gas-phase thiophene spectrum⁽²⁾ we can correlate the peak at -2.6 with Si electronic states, while the remaining 4 peaks are related to thiophene MO. The most noticeable difference between Fig. 1b) and 1c) resides in a diminished relative intensity of the first peak with respect to the remaining ones, according with the hypothetical formation of a multilayer of thiophene on the surface. In Fig. 1d) there is a clear reversal in the relative intensity of thiophene-related peaks and Si-related structures, with respect to previous spectra.

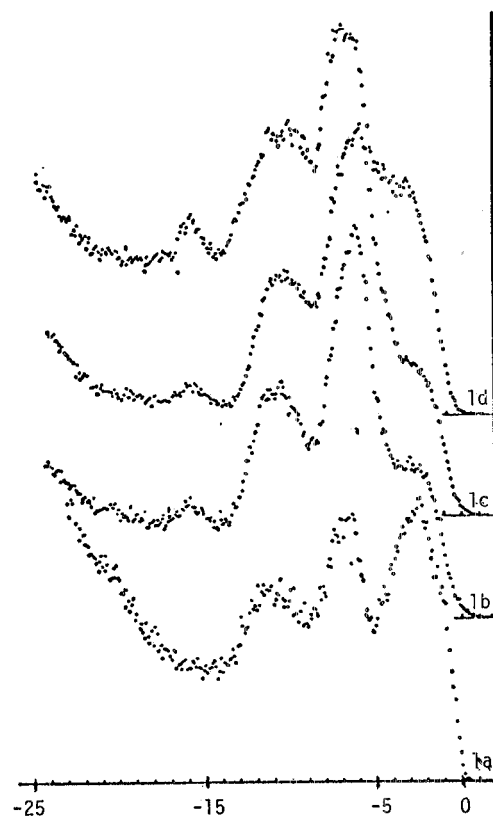


Fig. 1 - Photoemission spectra ($h\nu=40$ eV) of clean and C_4H_4S -adsorbed $Si(III)2 \times 1$. (See text).

Preliminary results on pyridine adsorption at $150^\circ K$ confirmed⁽³⁾ the existence, at low T , of an adsorption state different from that already found at room T ^(4,5).

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