

## Phthalocyanine L-B Film Gas Sensors

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Gas microsensors fabricated by Langmuir-Blodgett phthalocyanine [(C<sub>6</sub>H<sub>13</sub>)<sub>3</sub>SiOSiPcOGePcOH] film and planar microelectronic technologies are evaluated. The L-B film was patterned by a lift-off technique in a form compatible with other IC processes. A series of experiments was performed to characterize the film. The deposition ratio study and the contact angle measurement indicated that a good surface coverage was achieved after the third round trip. The refractive index (1.8) and monomolecular layer thickness (11.43 Å) were determined by ellipsometry measurement. The absorption coefficient (7.71 μm<sup>-1</sup> at λ = 6328 Å) was determined by the optical absorption experiment. The ohmic contact in the Pc/Au and Schottky contact in the Pc/Al were observed in the electrode metal study. It was suggested that the work function of the phthalocyanine may be in between 4.28 eV and 5.1 eV, which are the work functions of Al and Au, respectively. The intrinsic conductance of the film is quite insensitive to humidity. The change in conductivity with temperature from 20°C to 150°C of the LB films upon exposure to NO<sub>2</sub>/N<sub>2</sub> was studied. The conductivity of the film increased from 10<sup>-6</sup> to 10<sup>-4</sup> mho/cm as gas concentration increased from 0.33 ppm to 79 ppm. The response time and recovery time were about 1 minute in 79 ppm NO<sub>2</sub> at 155°C. In addition, the sensors were tested in chlorine gas. The experimental results indicated that the film is very sensitive to chlorine. The dynamic response to iodine gas was also explored.