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ペンタセン薄膜のバイアス電圧印加により誘起されるダイオード特性

Voltage Stress Induced Reversible Diode Behavior in Pentacene Thin Films

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The current–voltage characteristics of a vacuum-deposited 100 nm pentacene thin film have been measured *in situ* under ultrahigh vacuum[1]. The pentacene film was grown from 4×-sublimed starting material, on a single crystal [0001] sapphire substrate maintained at 30 °C. The deposition rate was 2 nm min^{-1}. 35 nm thick parallel strip electrodes of titanium metal were previously deposited on the substrate, spaced 0.1 mm apart. Despite identical electrodes the *I–V* curves are asymmetric, with the direction and degree of the diode-like behavior varying with sample and measurement history. After careful examination we have found that applying a positive or negative bias voltage of $|V|$ = 500 V for about 24 h while heating the film to 75 °C was sufficient to completely switch the diode forward direction. The switching action is fully reversible and the diode behavior, once switched, remains stable to repeated measurements at least over a period of several weeks. The activation energy, measured over a temperature range of 30-75 °C, also changes reversibly after application of the voltage stress bias stress. A complex variation of the activation energy with the applied potential was observed.

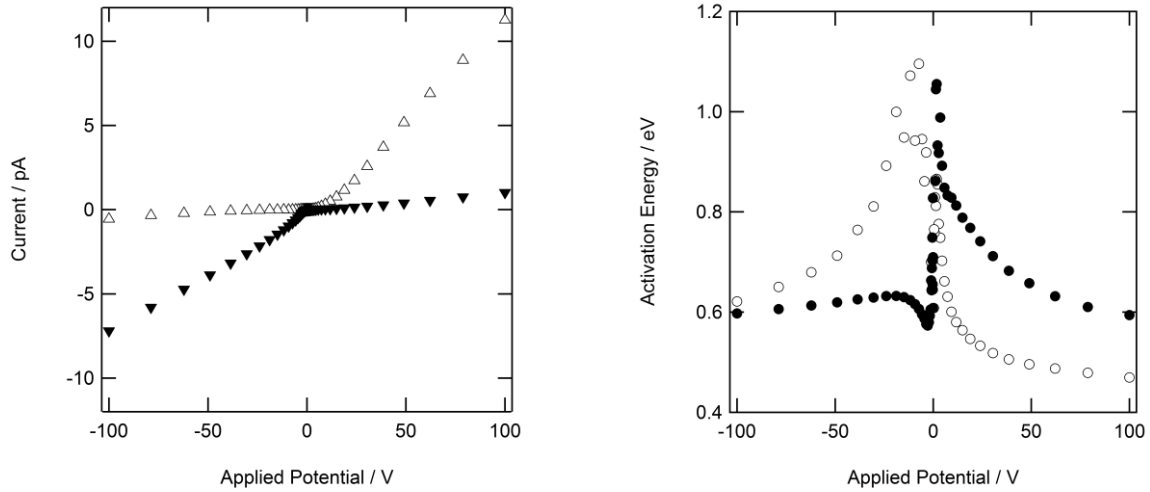

Fig. 1. Variation in device current (left) and the activation energy of electrical conductance (right) as a function of the applied potential, for the system after positive bias stress (△,○) and after negative bias stress (▼,●).

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