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Direct measurement of electric-field-screening length in thin graphite film H. MIYAZAKI, RIKEN and JST-CREST, K. TSUKAGOSHI, RIKEN, AIST, and JST-CREST, S. ODAKA, Y. AOYAGI, RIKEN, Tokyo TECH, and JST-CREST, T. SATO, S. TANAKA, H. GOTO, A. KANDA, Y. OOTUKA, Univ. of Tsukuba and JST-CREST — Electric-field-screening length in thin graphite film has been clarified by means of dual gating method. Sandwich type device structure which two gate electrodes are situated over and beneath a graphite film was constructed with Al top electrode. The Al electrode naturally generates thin gate insulator at graphite/Al interface, which enables extremely low voltage operation. Ambipolar charge conduction in a graphite film can be tuned by both top and back gate voltages. A scan of the top gate voltage (V_{tg}) generates a resistance peak in the ambiploar response. The back gate voltage (V_{bg}) shifts the ambipolar peak depending on the graphite thickness. The shift is larger in thinner film. The thickness-dependent peak shift is clarified in terms of the inter-layer screening length λ to the electric field in the dual-gated graphite film. We assume that the gate-induced carriers decay exponentially from both surfaces, and that the conductivity in each layer increases proportionally to the induced carrier density. Then the condition for the ambipolar resistance peak in V_{tg} scan is obtained as a function of V_{bg}, λ, and the graphite film thickness d. Applying this model to the thickness-dependence, we obtained a screening length of 1.2 nm experimentally.

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