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Contact-correlated bias stress instability in pentacene thin film transistors K. TSUKAGOSHI, S.D. WANG, T. MINARI, T. MIYADERA, Y. AOYAGI, RIKEN, Saitama 351-0198 and CREST-JST, Saitama 332-0012, Japan — The bias stress effect and large contact resistance are the remaining problems for practical applications of organic thin film transistors (OTFTs). The bias stress effect in top-contact pentacene TFTs was observed to be correlated with the metal/organic contact. The drain current decay under the bias stress condition results from the combination of the contact resistance change and the channel resistance change arising from the threshold voltage shift in the channel. The transistors with the different contacts (gold and copper) show the very similar channel properties. On the other hand, the bias-stress-induced contact resistance change in the gold transistor is much larger than the corresponding channel resistance change, so that the bias stress effect can be even dominated by the gold contact. In contrast, the copper contact is more stable, showing the small contact resistance change. The temperature variance measurements on contact resistance indicate that, the gold contact has a wider trap distribution compared with the copper contact, that is, there are much more deep trap states at the gold contact. Therefore, the time-dependent charge trapping in the deep traps is proposed to be the mechanism of the bias stress effect in OTFTs.

S. D. Wang
RIKEN, Saitama 351-0198 and CREST-JST, Saitama 332-0012, Japan

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