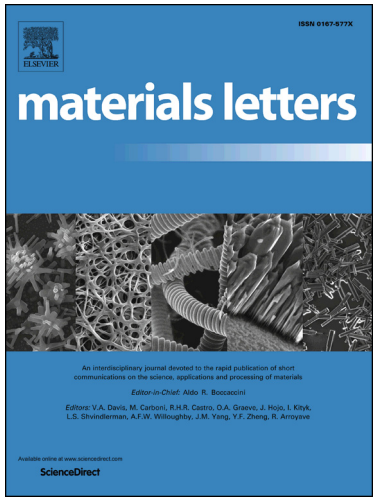

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A low temperature solution-processed ormosil film for low-voltage organic field-effect transistors

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Abstract

A high performance, low operating voltage organic field effect transistor (OFET) has been fabricated by utilizing organically modified silicate (ormosil) based film as dielectric. The ormosil film is fabricated by a sol-gel method at low temperature (180℃) and exhibits a high dielectric (k = 33), a smooth surface (R_q = 0.29 nm) and a low leakage current density (5×10^{-9} A cm^{-2} at -2 V). The ormosil film contains hydrophobic methyl (CH_3) functional groups derived from methyltriethoxysilane (MTES) and these groups produce a surface with hydrophobic character and low surface energy for pentacene film growth. The OFET with the ormosil dielectric exhibits excellent performs with high mobility (0.80 $cm^2 V^{-1} s^{-1}$), low operating voltage (-1.5 V), low threshold voltage (-0.25 V) and low sub-threshold swing (192 mV dec^{-1}). The result demonstrates that the ormosil film can be used as a high performance dielectric for OFETs, and provides a promising way for low power and low cost organic electronics.

Keywords: Composite materials, Low voltage, OFET, Sol-gel preparation, high k, pentacene

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