

Characterization of low-temperature solution-processable SiO₂ with precursors as the gate dielectrics

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Solution-processable silica sols were synthesized from silica nanoparticle and three types of organoalkoxysilanes using sol-gel reaction. Dielectrics were formed using spin coating procedures and cured at 150 °C for 1 h. The Si-O-Si networks between silica nanoparticle and organoalkoxysilanes were observed using Fourier transform infrared spectroscopy. The hydrophobic dielectric surface was formed from organoalkoxysilane containing methyl group. The film shrinkage formed from organoalkoxysilane including phenyl group was lowest. Capacitance-voltage (C-V) and current-voltage (I-V) behavior of the aluminum/dielectrics/p-Si MIS (Metal-insulator-semiconductor) structures were studied with various alkyl group contained organoalkoxysilanes. Organoalkoxysilanes with different alkyl group affected the dielectric property. The annealing effects of low-temperature solution-processable SiO₂ on the electronics behaviors were studied.