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Optimization of oxide processing and surface treatment to improve pentacene based organic field-effect transistors

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Abstract

Oxide quality is the very important for organic field-effect transistors (OTFT) because the charge accumulation takes place at oxide-semiconductor interface. First, we report the optimization of thermal oxidation of silicon. SiO₂ is grown in the temperature range of 850°-1050°C in oxygen. Effect of annealing in different atmospheres is also investigated. SiO₂ is characterized using C-V, I-V, and profilometer. After optimizing the insulator properties, OTFT are fabricated using re-grown SiO₂, i.e. grown oxide is first removed and then re-grown to improve the oxide quality. Finally, we fabricate top contact pentacene-OTFT on the optimized oxide and report its characteristics. We also discuss the optimization of surface treatment of oxide using OTS.