Solution-processed gate insulator for complementary thin film transistor applications on flexible substrate

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The solution-processed gate insulators have been studyed extensively for flexible device applications during recent decades. Some organic insulator materials which can be formed by solution process show acceptable leakage current characteristics and acceptable durability against lithography procedures when mixed with proper cross-linking agents. However, they have low dielectric constant compared to the high-k insulators, so they have a demerit that the film thickness should be thin enough to meet the required capacitance value. In this work, for the improvement of solution-processed gate insulator performance, we demonstrate a double-stacked PVP-co-PMMA/Al_2O_3 insulator deposited by solution process. The double-stacked insulator shows higher degree of uniformity than single layer. We also demonstrate a complementary inverter circuit using the double-stacked insulator. The fabricated inverter is composed of an a-IGZO thin film transistor as n-channel device and a pentacene thin film transistor as p-channel device. The double-stacked PVP-co-PMMA/Al_2O_3 insulator has an effect on overcoming the problems of Al_2O_3 or PVP-co-PMMA single layer, such as high leakage current and low dielectric constant, respectively. The fabricated inverter operates at the threshold voltage of 1.5 V and shows a high voltage gain of 17.3 V/V at the supply voltage of 3 V.