A Solution processed Hybrid gate dielectric prepared with cross-linkable metal ligand

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Since theuse of plastic substrates is essential for the implementation ofnext-generation display, stretchable and flexible displays, the development oflow-temperature processes is becoming more important. However, the conventionalprocess using chemical vapor deposition or sputtering equipment has excellentdevice performance, but it has a disadvantage in that the process temperatureis over 300 °C and expensive manufacturing equipment and long process time arerequired. Therefore, A method using a sol-gel method which can manufacture asolution-type material as an alternative and can manufacture a device at a lowtemperature has been emerging. [1-2]. It is expected that the devicefabrication becomes simple and economical by fabricating the gate insulatingfilm in the thin film transistor (TFT) at a temperature lower than 250 °C byusing the sol-gel method.

In this work, we fabricated the ZrAand ZrA-Polymer hybrid gate dielectric with UV treatment andLow temperature annealing. we proposed cross-linking mechanism of ZrA monomers exposed by UVtreatment [3]. As shown in FT-IR analysis, This mechanism was confirmed thatC=C double bonding is changed to C-C single bonding. We also speculated thatthe cross-linkable ZrA monomers were connected to polymer-backbone via UVtreatment. As a result of the optimization of UV treatment and low temperatureannealing, Hybrid gate dielectric of network structure was obtained throughcrosslinking between ZrA and polymer.

To measure the electrical characteristics anddielectric constant, Metal-insulator-metal(MIM) structures were fabricated using the Hybrid gate dielectric. We obtaineda low leakage current density (J_g) of 5.80E-7 A/cm^2 (at 1MV/cm), a reasonable breakdown voltage of 2.99 MV/cm and a high dielectricconstant of 9.24 at ZrA gate dielectric.

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