

Investigation of structural and electrical properties of Al₂O₃/PVP nano hybrid composite (as OFET dielectric gate)

B. Soltani¹, M. Babaei pour^{1*}, A. Bahari²

1-Department of Physics, Univ. of Buali Sina Hamedan

2-Department of Solid State Physic, Univ. of Mazandaran, Babolsar

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Abstract: Al₂O₃/PVP nano-hybrid composite samples are synthesized using sol-gel method at 75°C. Weight percent of poly 4-vinyl phenol and aluminum oxide is 0.0, 0.28, 0.56, and 0.84. To study the nano-structural and electrical characteristics, X-ray diffraction, Fourier transfer infrared radiation, scanning electron microscopy, and atomic force microscopy are used. Dielectric constant of the samples is measured using “GPS 132 A” multi-meter. The results show that the highest amounts of dielectric constant at the frequency of 120 and 1 kHz are related to Al₂O₃ + 0.28 %wt. PVP(k=35) and Al₂O₃ + 0.56 %wt. PVP (k=26) nano-composite samples, respectively. Therefore, at the frequency of 120kHz, Al₂O₃ + 0.28 %wt. PVP nano-composite sample, due to having higher equivalent oxide thickness, less roughness, ohmic properties, smaller size of nano-crystallites (Scherrer diameter of 45nm), higher dielectric constant, and as a result of less leakage current, is recommended as the gate dielectric for the future of organic field effect transistors.

Keywords: *nanocomposites; organic field effect transistor; gate dielectric; Sol-gel method.*

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*Corresponding author, Tel:09183165662, Email: babaei@basu.ac.ir