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Frequency Dependent Dielectric and I-V Properties of Polyaniline/Ta2O5 Composites

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Abstract

Polyaniline - Ta2O5 composites were synthesized by in situ polymerization technique at 0 to 5 degrees temperature. The prepared composites were characterized by FTIR for structural study and surface morphologies analyzed by scanning electron microscopy (SEM). The important peaks such as benzenoid, quinoid rings and MO stretching confirms the formation of composites. SEM image shows that the grain size increases with increase in tantalum pentaoxide concentration in polyaniline. In DC conductivity 30 wt% shows maximum conductivity of 8.27 x 10(-2) S/cm due to the hopping of polarons and bipolarons through polymer chain. Further the AC conductivity was carried out by Kelvin two probe methods and found that conductivity depends on the applied frequency as well as concentration of Ta2O5. From the dielectric studies, it is observed that 20wt% shows the lowest dielectric constant due to the lower bulk resistance as a result conductivity enhances up to 0.86 S/cm. The J-V characteristics show the maximum current of 1.4 x 10(-3) Amp by applying a bias of +/- 5 volt.

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