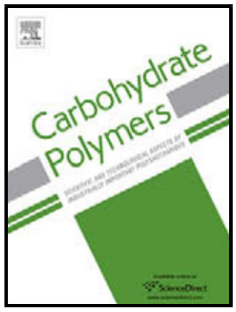

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Dielectric behaviour of montmorillonite/cyanoethylated cellulose nanocomposites

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Highlights

- A novel dielectric CRS- MMT nanocomposite was prepared.
- At 1 kHz high ε_r of 71, 55 and 42 with 5, 10 and 15% weight of MMT respectively.
- Low leakage current densities (10^{-6} -10^{-7} A/cm^2).
- Leakage pathways are associated with MMT nanoplatelets embedded in CRS.

Abstract

A dielectric nanocomposite based oncyanoethylatedcellulose (CRS) and MMT nanoclay was successfully prepared with different weight percentages (5%, 10% and 15%) of MMT. MMT nanoplatets obtained via sonication of MMT nanoclay in acetone for a prolonged period was used in the preparation of CRS-MMT nanocomposites. CRS-MMT thin films on SiO_2/Si wafers are used to form metal-insulator-metal (MIM) type capacitors. At 1 kHz CRS-MMT nanocomposites exhibited high dielectric constants (ε_r) of 71, 55 and 42 with low leakage current densities (10^{-6} -10^{-7} A/cm^2) for nanocomposites with 5%, 10% and 15% weight of MMT respectively, higher than values of pure CRS (21), Na-MMT(10). Reduction of ε_r with higher MMT loading can be attributed to a network formation as evidenced via strong bonding interactions between CRS and MMT leading to a lower molecular mobility. The leakage is studied using conductive atomic force microscopy (C-AFM) indicates that leakage pathways are associated with MMT nanoplatelets embedded in the CRS polymer matrix.