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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  $\epsilon_r$  of 71, 55 and 42 with 5, 10 and 15% weight of MMT respectively.
- Low leakage current densities ( $10^{-6}$  - $10^{-7}$  A/cm<sup>2</sup>).
- Leakage pathways are associated with MMT nanoplatelets embedded in CRS.

### Abstract

A dielectric nanocomposite based on cyanoethylated cellulose (CRS) and MMT nanoclay was successfully prepared with different weight percentages (5%, 10% and 15%) of MMT. MMT nanoplatelets 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<sub>2</sub>/Si wafers are used to form metal-insulator-metal (MIM) type capacitors. At 1 kHz CRS-MMT nanocomposites exhibited high dielectric constants ( $\epsilon_r$ ) of 71, 55 and 42 with low leakage current densities ( $10^{-6}$  - $10^{-7}$  A/cm<sup>2</sup>) for nanocomposites with 5%, 10% and 15% weight of MMT respectively, higher than values of pure CRS (21), Na-MMT(10). Reduction of  $\epsilon_r$  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.

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