Solvent assisted improvement of the dielectric properties and hysteresis behavior in poly'4'vinylphenol (PVP) thin films

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ABSTRACT:

The role of casting solvent, for casting the PVP dielectric layer in terms of variation in leakage current, dielectric constant and hysteresis voltage was investigated. The leakage current through the pristine (PVP) and cross linked PVP dielectric thin films cast with two different solvents namely Methanol and propylene glycol methyl ether acetate (PGMEA) was measured. Leakage current and dielectric constant in pristine PVP thin films reduced when low polarity solvent was used for casting the films (PGMEA in our case) and further reduced while PVP was cross linked with polymelamine-co-formaldehyde (MMF). This variation in the dielectric constant and the leakage current was attributed to the variation of the –OH group density present at the polymer dielectric thin films cast with different solvents. The variation of –OH group density among the samples was confirmed by the variation of 3290 cm^{-1} peak intensity, associated with hydroxyl group stretching, in FTIR spectra. Additionally, Contact angle study further revealed that the dielectric thin films cast with different solvents contained different amount of –OH group density. Hysteresis voltage, observed in the MIS structure fabricated on these PVP thin films further confirmed variation in –OH group densities. These results are critical for development of all organic FETs.