Electrospinning of Associating Small Molecules

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ABSTRACT

Electrospinning uses a strong voltage to draw sub-micron diameter sized fibers from a polymer melt. Electrospinning non-covalently associating small molecules, instead of polymers, was investigated. Through such interactions as hydrogen bonding and van der Waal's forces, a sufficient number of entanglements is reached that allows phospholipids and bis-urea organogelators to electrospin successfully. Out of a 4 weight percent solution in 2-butanol, (-)-(S,S)-hexadecyl-3-[2-(3-hexadecyl-ureido)cyclohexyl]urea was successfully electrospun into fibers with unique morphologies, viewed by scanning electron microscopy (SEM). Adding 6 mol water to a solution of phospholipids inhibits electrospinability whereas 3 mol water aides in electrospinning. Rheology data shows that the presence of 3 and 6 mol water creates a shear thickening and shear thinning phenomenon, indicated by a sharp increase then decrease in the viscosity of the system. Rheology data could also help elucidate inhibitory effects water has on phospholipid electrospinability.