Effect of Bénard-Marangoni Instability on the Formation of Electrically Conductive Network during Solvent Evaporation in Solution Casting Process for Amorphous Polymer/MWCNTs Hybrid Films

전상일, 이헌상*
동아대학교
(heonlee@dau.ac.kr*)

We employed various amorphous polymers such as polycarbonate, poly(methyl methacrylate), polystyrene, and poly(styrene-co-acrylonitrle) and MWCNTs to fabricate transparent, electrically conductive polymer/CNT hybrid films. In solution casting process, ring-shaped cells composed of MWCNTs were observed in the hybrid film. These cells were caused by Bénerd-Marangoni instability during solvent evaporation. We found that the electrical conductivity of hybrid films strongly depends on the shape of Bénard-Marangoni cells. There may be two driving forces on the Bénard-Marangoni instability; surface tension gradient and buoyancy. And the surface tension gradient is affected by temperature and concentration. Polymer/CNT hybrid films studied exhibit the lowest surface resistivity near the value of Ma_T 25 which is onset point of Bénard-Marangoni instability. We performed dynamic light scattering (DLS) analysis to study the effect of cooperative diffusion on the instability.