High-Mobility and Air-Stable Organic Field-Effect Transistors with Thermally-Crosslinked Bottlebrush Polymer Gate Dielectrics

양희수, 김명진[1], 강범구[2], 이병훈†
이화여자대학교; [1]한국화학연구원; [2]숭실대학교
(leebhoon@ewha.ac.kr†)

We report high-performance and air-stable organic field-effect transistors (OFETs) fabricated with bottlebrush polymer gate dielectrics thermally-crosslinked in a remarkably short time. By utilizing the bottlebrush polymers with a varied degree of polymerization prepared by living anionic polymerization and ring opening metathesis polymerization, we investigate the effect of density of alkyne functional groups per repeat unit on on-set crosslinking time (t_c) and device properties of the bottlebrush polymers. Interestingly, the bottlebrush polymer having the higher density of alkyne groups showed reduced t_c and hence the lowest t_c (0.6 min) is obtained from the bottlebrush polymer with the highest density of alkyne functional groups. Combined with the superior device performance and extended device lifetime of OFETs fabricated with the bottlebrush polymers thermally-crosslinked in a sufficiently short time ($\leq$ 1 min), these results demonstrate that bottlebrush polymers with tailored density of grafted alkyne functionalities would be promising dielectric materials for realization of high-performance OFETs fabricated by a high-throughput fabrication method.