Overcoming Doping Challenges in Organic Electronics

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[Abstract]

Doping has been a key topic in organic electronics since the demonstration of a metallic conductivity in doped p-conjugated polymers. However, it has been difficult to prevent dopant-induced structural and energetic disorder, while maintaining a high conductivity. We have developed an efficient doping method based on solid-state diffusion of 2,3,5,6-tetrafluoro- 7,7,8,8-tetracyanoquinodimethane (F4-TCNQ) which introduced a minimal structural disorder in various conjugated polymers including poly(2,5-bis(3-hexadecylthiophen-2-yl)thieno[3,2-b]thiophene) (PBTTT). The doping enabled a consistent observation of both a nearly-ideal Hall effect and a two-dimensional weak-localisation phenomenon in the doped PBTTT, for the first time for conducting polymers, to the best of our knowledge [1]. Furthermore, we have recently employed this doping method to enhance charge injection properties in organic field-effect transistors (FETs) [2, 3]. A selective contact doping of bottom-gated PBTTT FETs by solid-state diffusion of F4-TCNQ achieved a significantly lower contact resistance. Our developed post-doping treatment was shown to be effective for resolving dopant diffusion problem, which is essential for designing stable and low-power organic electronic devices by utilizing doping of conjugated polymers.

[연사 약력]

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[관련 논문]

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