Green organic electronics via water-borne process

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Organic semiconductors are key building blocks for future electronic devices that require unprecedented properties of low-weight, flexibility, and portability. Up to now, all the 'record high mobility' values (>5 cm^2/Vs) from organic semiconductors have been processed from toxic solvents.
However, a harsh regulations led by government have been implemented to restrict toxic solvent emissions, and as we are well aware of, 'water' is the most abundant and clean resources among all kind of available solvents, especially in view of industrial interest.
In this work, for the first time, we demonstrate a novel but facile method to fabricate water-borne polymeric semiconductors with high charge carrier mobility of 2.5 cm^2/Vs. We have developed 'smart surfactant engineering', which enables very efficient removal of non-ionic surfactant after film deposition from water-borne colloids, leading to recovering of inter-particle charge coupling and therefore high charge carrier mobility. Structural and chemical analyses showed that films consisting of polymer nanoparticles are nearly free from surfactants and still maintained high degree of edge-on crystalline orientation, which was enough to render high charge carrier mobility.