Surfactant-Induced Solubility Control to Realize Water-Processed High Precision Patterning of Polymeric Semiconductors for Full Color Organic Image Sensor

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A fully water-based patterning method for polymer semiconductors was developed and utilized to realize high-precision lateral patterning of various polymers. Water-borne polymer colloids, wherein hydrophobic polymers are dispersed in water with the assistance of surfactant molecules. When this surface is exposed to a washing molecule with the ability to weaken the pristine van der Waals (VDW) interaction between the polymer and the surfactant and to form a new VDW interaction with the surfactant, then the surface of the polymer film recovers its original hydrophobic nature. Such surfactant-induced solubility control (SISC) enables water-processed and high-precision patterning of various polymer semiconductors with totally different solubilities. B-/G-/R-selective photodiodes with a pixel size of 100 μm × 100 μm were fabricated and patterned by this water-based SISC method.