Fluorous Solvent-Soluble Photoresists based on a Photodimerization Chemistry

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Abstract

Organic electronics has progressed remarkably in several types of applications, including organic light emitting diodes (OLEDs), organic thin film transistors (OTFTs) and organic photovoltaics (OPvs). In particular, these devices boast of their easy fabrication methods employing vacuum deposition or solution-processing as unique ways to large area, affordable, flexible electronics products. However, it is regarded not easy to make finely-patterned consumer electronics-grade devices with organic electronic materials because of the lack of patterning protocol on those delicate substances. When a shadow mask evaporation technique is used, the position and quality of the deposited films are out of control under certain length scale. Although conventional photolithography may be used to pattern organic devices with more precision, this method are doomed to failure because of the photoresist materials dissolved in organic solvents and harsh organic developers resulting in damages on organic materials.

This situation has lead us to develop an alternative high precision photolithography system employing highly fluorinated photoresists and fluorous solvents (we call this as ***Orthogonal Processing***) in order to settle down the technical issues. We synthesized a copolymer, P(FDMA-AHMA), as a negative-tone photoresist that can make images by a photodimerization chemistry by rinsing hydrofluoroether solvents. Along with photoresist synthesis, we are also going to show simple applications of the photoresist materials on the patterning of light-emitting materials.

References

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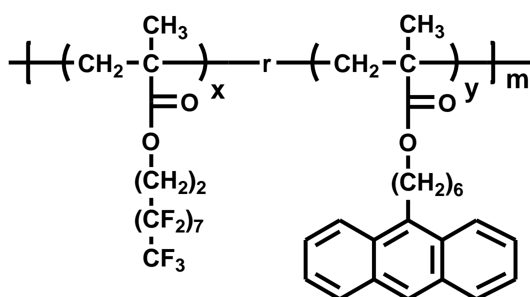
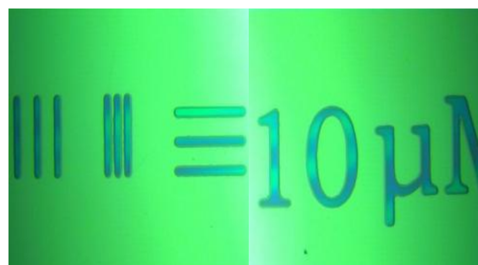
Figures



P(FDMA-r-AHMA)

Figures1. A negative-tone photoresist based on a photodimerization chemistry



Figures2. Patterned images of P(FDMA-AHMA)