Ultrathin, Lightweight and Flexible Organic Light-Emitting Devices with a High Light Outcoupling Efficiency (EGSR_2)

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High-efficiency, flexible organic light-emitting diodes (OLEDs) are of interest for display and lighting applications. However, they often suffer from inefficient light extraction, and many outcoupling schemes are incompatible with flexible OLEDs. Here, we demonstrate a corrugated, ultrathin (10 μm), light-weight (20 g/m^2), and flexible OLED on a polychloro-p-xylylene (parylene) substrate. A visible-wavelength-scale random corrugation pattern is imprinted on both surfaces of the parylene substrate. The pattern efficiently outcouples the trapped susbstrate substrate, waveguide and surface plasmon modes. The corrugated parylene OLED (CP-OLED) has an external quantum efficiency, 27.8 ± 1.7% compared with 20.5 ± 1.3 for devices on conventional flat glass substrates. The CP-OLED shows a Lambertian emission profile with identical spectra at viewing angles from 0 to 90 degrees from normal.