TRANSPARENT MICROCAVITY PLASMA DEVICES FOR HIGH RESOLUTION FLEXIBLE DISPLAY APPLICATION

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Lightweight and optically transparent microcavity plasma devices have been fabricated on plastic substrates by replica molding techniques. Polymer-based replica molding processing enables precisely controlled fabrication of complex arrays in an inexpensive, transparent, and flexible substrate that is both disposable and recyclable.

Each microplasma cavity has cross-sectional dimensions of 200×200 μm^2. Microcavities are patterned by soft lithography, replicating the mold shape in a liquid polymer material cured by UV radiation. The process allows for cavities with depths of tens of micrometers to be fabricated reproducibly. Three fluorescent dyes for red, blue, green color emission are encapsulated in the cavities with protective layers of SiO_2 and TiO_2, and the dyes are excited by UV emission from the microplasma in each cavity.

Plastic based arrays have been demonstrated that generate uniform glow discharges confined to microcavities without dielectric breakdown over a broad range of gas mixtures and pressure. When the array is driven by a 20 kHz sinusoidal voltage waveform, the conversion of ultraviolet radiation into visible light inside microcavities may enable a new solution to the requirement for flexible displays. Details concerning the performance of these primary color emitting microplasma sources will be presented.

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