Abstract

Nanocellular materials can contribute to the efficient use of energy in different ways, e. g. as a perfect insulating material (nanofoam) or as a thin layer with low refractive index for more efficient light out-coupling from organic light-emitting diodes (OLEDs). Nanoscaled microemulsions represent the ideal starting point for the fabrication of closed-cell or open-cell nanofoams. According to the *Principle of Supercritical Microemulsion Expansion* (POSME) (DE 10260815B4) a microemulsion with a supercritical fluid is formulated. The nanometer-small microemulsion droplets are then transformed by reducing the pressure into still nanometer-small gas bubbles forming a foam which is fixed by polymerization. The fixation of the resulting nanofoam is complicated by coalescence and Ostwald ripening. In this work strategies have been developed to suppress these aging processes. Thus, a monodisperse foam as fine as possible should be achievable. Working on examples from different polymer classes such as melamine-formaldehyde resins, polyurethanes, electrically conducting polymers based on oxetane-functionalized triphenylamine dimers, and polymethacrylates first nanofoams were obtained and routes how to continue were delineated. Thus, the industrial production of nanofoams according to POSME has come in reach.