

Multi-graded foams by gas foaming

Layered and graded foams have proven superior to their uniform counterparts in terms of structural, and functional properties. This is also suggested by nature, abundant with porous material structures whose attributes are far beyond any artificial foam. To date, advanced foamed structures are generated via advanced though complex/time consuming technologies. Here we explore the possibility to generate layered and graded polymeric foams by using the simple gas foaming technology, with the sole introduction of time-varying boundary conditions of the gas sorption stage. We show that, by ingeniously designing the sorption step, it is possible to achieve non-trivial gas concentration profiles and, correspondingly, at pressure release, foams with density and/or morphology profiles. As a model system, we foamed polystyrene and polycaprolactone with CO₂ and N₂, and achieved three- as well as five-layered foams, gradually or sharply graded, yet in a single foaming step (pressure release) executed after different sorption protocols

