Three-dimensional Flash Flow Microreactor for Scale-up Production of Monodisperse PEG-PLGA Nanoparticles

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We present for the first time the production of PEG-PLGA nanoparticles in a ~ 10^1gram-scale (g/h) using novel polyimide (PI) film microreactors with direct 3D flow focusing geometry that enhanced the productivity by performing at such a flash flow (11ms of retention time in a unit microchannel). The 3D flash flow microreactor (3D-FFM) system fabricated by stacking the resistant PI polymer film layers and subsequent one-step adhesive bonding process consisted of 8 sets of microreactors in parallel with the diverged inlets and a converged outlet. In addition, the PI polymer film based direct 3D hydrodynamic flow focusing geometry led to zero aggregation and clogging, thus rendering it suitable for long term use even at very high flow rate of concentrated polymer.