In situ preparation and osteogenic properties of bionanocomposite scaffolds based on aliphatic polyurethane and bioactive glass nanoparticles

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 Bionanocomposite scaffolds based on aliphatic polyurethane (PU) and bioactive glass nanoparticles were produced by using a one-step in situ polymerization method. Bioactive glass nanoparticles (nBG) or mesoporous BG nanospheres (nMBG) were incorporated during the polymerization reaction to produce simultaneous formation and foaming of porous nanocomposite scaffolds. The in vitro bioactivity of the scaffolds was assessed in simulated body fluid (SBF), and through cytocompatibility and osteogenic differentiation assays with stem cells. Bone regeneration properties of the scaffold materials were in vivo assessed by using a critical-sized femoral defect model in rat. The scaffold nanocomposites showed excellent cytocompatibility and ability to accelerate the crystallization of bone-like apatite in vitro. nBG/PU bionanocomposite scaffold exhibited the higher capacity to stimulate osteogenic cell differentiation as judged by an increased ALP activity and the presence of