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# Photocrosslinkable Nanocomposite Ink for Printing of Strong, Biodegradable and Bioactive Bone Graft

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**Abstract :** 3D printing is used in creating bone grafts of various architectures by printing materials in a layer-by-layer manner. Traditionally, to make materials printable, heating up or dissolving materials in organic solvents have been used, compromising their capability in loading biomolecules. Photocrosslinkable materials which are initially liquid and printable, and solidified upon light exposure are therefore developed. However, the existing photocrosslinkable materials are either too soft to bear load or non-degradable with potential long-term biocompatibility problems. Here, photocrosslinkable nanocomposite ink is developed composed of poly (lactide-co-propylene glycol-co-lactide) dimethacrylate (PmLnDMA) and hydroxyethyl methacrylate-functionalized hydroxyapatite nanoparticles (nHAMA) mimicking the hairy setae of gecko that can strongly interact with its surroundings to bear high load. Incorporation of nHAMA into PmLnDMA endows the nanocomposite ink with several advantages in (1) improved organic/inorganic interfacial compatibility to increase mechanical strength, (2) readily modulated rheological behaviors, wettability, and biodegradation, (3) enhanced osteoconductivity and osteoinductivity. Moreover, the ink can be rapidly crosslinked upon light exposure, load, and long-term release growth factors, and be printed into 3D bone scaffolds of various shapes and structures according to the patients' needs. Altogether, this innovation will benefit patients all over the world who suffer from bone fractures, tumors, infections.

**Keywords :** photocrosslinkable nanocomposite, 3D printing, bone ink, personalized medicine
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