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Room-temperature self-healing tough nanocomposite hydrogel crosslinked by zirconium hydroxide nanoparticles

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ABSTRACT: Tough hydrogels with excellent self-healing properties at room temperature are of great importance for their potential applications in biomedical fields. Here, we demonstrate a design of novel zirconium hydroxide crosslinking nanocomposite hydrogel that combine high toughness (compressive strength of 36.6 MPa and tensile strength of 404.3 KPa) and self-healing efficiency (86%) at ambient condition. The Zr-NC gel was synthesized by the random copolymerization of 2-acrylamido-2-methyl propane sulfonic acid (AMPS) and acrylamide (AM) through a facile preparation. The designed hydrogen-bonding network can be tuned through changing the molar ratio and zirconium hydroxide. This novel Zr-NC gel will open an avenue for the healable artificial cartilage and tissue engineering.

KEYWORDS: Self-healing; Nanocomposite hydrogel; Zirconium hydroxide nanoparticles; High strength

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