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Paper Title:	Cerium-Zinc-Strontium-Doped Mesoporous Bioactive Glass Nanoparticles for Bone Regeneration Applications
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Abstract

Mesoporous bioactive glass nanoparticles (MBGNs) are widely investigated as biomaterials in bone tissue engineering due to their biocompatibility and excellent bioactivity. Their ability to form hydroxycarbonate apatite (HCAp) is particularly remarkable. During the bone-repairing process after surgery, inflammatory responses, infection, and increased levels of oxidative stress can prolong healing time. Cerium (Ce) exhibits antioxidant and antibacterial activity, while Zinc (Zn) has anti-inflammatory and antibacterial effects. Additionally, Strontium (Sr) has an osteogenic effect. Therefore, this study aims to incorporate therapeutic ions, including Ce, Zn, and Sr, into MBGNs (Ce-Zn-Sr-MBGNs) using microemulsion-assisted sol-gel and post-functionalization methods based on the SiO2-CaO system. The results demonstrated that all samples had a spherical shape with a porous structure. 2.5Ce-0Zn-Sr-MBGNs showed a smaller size (115±12 nm) compared to 0Ce-0Zn-Sr-MBGNs (175±16 nm). Additionally, the particle sizes of 2.5Ce-0Zn-Sr-MBGNs and 2.5Ce-2.5Zn-Sr-MBGNs were not significantly different. Furthermore, FTIR results were similar across all samples. Thus, Ce affects the size of the particles but does not influence chemical bonding.