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(57) Abstract :
The present invention relates to a novel bioglass composition for bone replacement, comprising SiO2 (45-55%), CaO (20-30%), P2O5 (5-10%), Na2O (10-20%), and rare-earth oxides (CeO2, La2O3, Gd2O3) (1-5%). The rare-earth elements enhance bioactivity, antimicrobial properties, mechanical strength, and controlled ion release for improved bone regeneration. The synthesis process includes raw material preparation, ball milling, high-temperature melting (1300-1500°C), rapid quenching, and grinding to obtain powders or scaffolds. The bioglass is characterized using XRD, FTIR, SEM, mechanical testing, and bioactivity evaluation in simulated body fluid (SBF). The composition is suitable for bone grafts, implants, and scaffolds in orthopedic and dental applications. With improved osteoconductivity, mechanical integrity, and infection resistance, the invention provides an effective alternative to conventional bone graft materials.

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