03-166

45S5 Bioglass®-based compositions containing alumina and strontium

Araujo, M.S.(1); Bartolomé, J.F.(2); Silva, A.C.(1); Mello-castanho, S.R.(1);
(1) IPEN; (2) ICMM-CSIC;

Although bioactive glasses have been widely used for surfaces of orthopedic and dental implants its poor processing window and limited mechanical strength, low toughness and wear resistance has prevented their use in applications such as load bearing devices. Considering that in suchlike material even a small variation in the composition can deeply modify its features leading to very different physico-chemical or mechanical properties, the present research was conducted by modifying the glass network of 45S5 Bioglass® by adding Al2O3 and SrO in order to obtain a glass high bioactive and with better mechanical and tribological performance for biomedical applications. The findings in this study overcomes the barrier that Incorporation in high levels of ionic species such strontium into bioactive glasses compositions is essential to promote enhanced thermal stability and other desirable characteristics. The addition of 2% of Al2O3 and 2% of SrO produced a dense material with elastic modulus around 50 GPa same as 45S5. Moreover, the bending strength increased 60% and toughness doubled. On the other hand, the wear rate obtained against steel was found to be three times lower than 45S5. Additionally, biocide test performed against gram-negative bacteria E. coli indicates that antimicrobial efficacy was enhanced. Also, biological evaluation from SBF test showed higher bioactivity. Still, the composition proposed was found to have an optimized working window and higher resistance to crystallization.