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PLASMA POLY(ACRYLIC ACID) COMPATIBILIZED HYDROXYAPATITE-POLYLACTIDE BIOCOMPOSITES FOR THEIR USE AS BODY-ABSORBABLE OSTEOSYNTHESIS DEVICES

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Abstract

The nanoscale interface between hydroxyapatite (HA) particles and PLLA matrix appears to be the determining factor for poor mechanical performance of this family of biocomposites in load-bearing applications. It has been demonstrated that when these biocomposites are loaded, the physical adsorption between inorganic particles and polymeric matrix does not allow for load transfer and additional free surfaces that act as crack nucleators are created. To overcome this limitation, we propose plasma polymerization of poly(acrylic acid) (PAA) on HA particles as an effective method to produce strong interactions with the polylactide (PLLA) matrix. In this work, evidences of an intimate bonding between HA_{PAA} particles and PLLA are given. Based on the thermodegradation behaviour of the composites it was found that the plasma deposited layer arrested free hydroxyl groups of PLLA chains, hindering the transesterification reactions that cause the thermal degradation of PLLA. As a result, thermal degradation of the composites was retarded and followed the chain scission route producing acetaldehyde, CO and CO_2. From the mechanical characterization it became clear that load transfer was developed by means of the PAA compatibilized interface resulting in the observed enhancement of the elasticity and damping behaviour of the biocomposites.