Thermal and structural characterization of hybrid hydrogels composed of amidogenics peptides and PEG-silanized

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Peptide hybrid hydrogels are a promising alternative for obtaining nanoscopic biocompatible structures. The variety of combinations between different amino acids allows the construction of a vast number of supramolecular architectures with equally diverse physicochemical properties. Thus, combining hybrid copolymers with biomolecules makes them interesting for biomedical applications such as tissue engineering and drug carrier systems. In this work a new class of hybrid hydrogels was obtained by the sol-gel process, based on an amyloidogenic peptide sequence composed exclusively of arginine, phenylalanine and glycine (Gly [Arg-Phe]$_4$).

This was synthesized and functionalized with an alkoxysilane via phase solid, then covalently bonded to the silanized polyethylene glycol. The thermal tests allowed us to observe that the presence of the peptide in the hydrogel increases the number of cross linkers and a glass transition has emerged that indicates increased mobility between the PEG polymer chains. Rheological properties showed that hydrogels have predominantly elastic characteristics, with storage modulus (G') greater than loss modulus (G”) in all compositions and demonstrated thixotropic property for peptide conjugate samples.
We also performed experiments small angle X-ray scattering (SAXS) which brought information about structures in the nanometer range, we propose a model fit the experimental curves showing that the system has two independents from each other morphologies. The images by electron microscopy and atomic force images revealed amorphous and fibrillar regimes depending on the concentration of peptide-silane in the hydrogel matrix corroborating with the SAXS results.

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