Dehydropeptide-based self-assembled hydrogels with incorporated Gd\(^{3+}\) chelates: potential Contrast Agents for MRI?

Teresa Pereira\(^a\), Juan Gallo\(^b\), Manuel Bañobre-López\(^b\), Loic Hilliou\(^c\), Paula M.T. Ferreira\(^a\), and José A. Martins\(^a\)

\(^a\)Centre of Chemistry, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal; jmartins@química.uminho.pt
\(^b\)International Iberian Nanotechnology Laboratory (INL), Av. Mestre José Veiga s/n, 4715-330 Braga, Portugal
\(^c\)Institute for Polymers and Composites, Department of Polymer Engineering, University of Minho, Campus de Azurém, 4800-058 Guimarães, Portugal

Magnetic Resonance Imaging (MRI) is at the forefront of clinical imaging. Paramagnetic relaxers (Gd\(^{3+}\) and Mn\(^{2+}\) chelates, iron oxide nanoparticles) shorten the relaxation times \((T_{1,2})\) i.e. enhance the relaxation rates \((R_{1,2} = 1/T_{1,2})\) of the water protons in their vicinity yielding significant contrast enhancements-contrast agents. Supramolecular (self-assembled) hydrogels based on low molecular weight peptides are the new paradigm biomaterials: porous soft biocompatible materials made of highly hydrated fibrous 3D nanostructures, reminiscent of the extracellular matrix. Our research group developed self-assembled hydrogels based on dehydrodipeptides \(N\)-capped with naproxen (Npx, a NSAID drug). Dehydropeptide-based hydrogels exhibit resistance to proteolysis, are biocompatible and suitable nanocarriers for delivery of incorporated drugs. Recently, we demonstrated that incorporation of SPION endows dehydropeptide-based hydrogels with magnetic properties (magnetogels): hyperthermia and MRI reporting properties. In this communication we report novel supramolecular hydrogels prepared by co-assembly of dehydrodipeptides and Gd\(^{3+}\) chelates. The hydrogels are characterised regarding co-assembly (fluorescence, CD spectroscopy) and micro- nano-structure (STEM) and rheologial properties. The co-assembled hydrogels are characterized also as Contrast Agents for MRI by \(^1\)H relaxometry (60 MHz, 37°C) and MRI (120 MHz, 37°C).

![Dehydrodipeptides](image1)

![Gd(DO3A-Npx)](image2)

*Figure 1*

The authors acknowledge the FCT under the Project PTDC/QUI-QOR/29015/2017 and CQ/UM UID/QUI/00686/2013 and UID/QUI/0686/2016 projects.