

Novel Strategies using Ionic Systems for early detection of Neurodegenerative Diseases

Andreia Forte

LAQV-REQUIMTE, NOVA School of Science and Technology, Universidade NOVA de Lisboa

Neurodegenerative diseases (DN) are incurable and highly incapacitating diseases characterized by the progressive degeneration and death of neural tissues.¹ According to World Health Organization, it is estimated that almost 50 million people have dementia worldwide and it is expected that this number triple by 2050. One of the main problems associated with this type of pathologies, is the fact that they are detected at a late stage where the treatment options are less effective.¹ Imaging techniques that are currently being used to diagnose these disorders include positron electron tomography (PET), computed tomography (CT), and also magnetic resonance imaging (MRI). Being less invasive, with a good tissue contrast, and a safer option since it does not use ionizing radiation, MRI has gained greater attention in the most recent years. Several studies have been carried out to find new molecules with the ability to increase the contrast between tissues allowing a more accurate and early diagnosis of these diseases.²

Ionic Liquids (ILs) as tuneable organic salts and, more specifically, Magnetic Ionic Liquids (MILs), have been applied in many research fields including material science and pharmaceuticals, among others.^{3,4} These magnetic salts, as well as other systems such as magnetic nanoparticles, have been studied as potential contrast agents for Magnetic Resonance imaging (MRI) technique.⁴

Herein, we have developed biocompatible magnetic ILs or organic salts based on the combination between choline derivative cations and Mn(II), Gd(III) or Tb(III) anion complexes. All compounds were characterized by spectroscopy (NMR, FTIR, UV-Vis, Emission); magnetic susceptibility; thermal properties; and about their toxicity. In parallel, some of these ILs were functionalized with Mesoporous Silica Nanoparticles (MSNs) in order to evaluate their applicability.⁵

Keywords: Magnetic Ionic liquids, Manganese & Lanthanides, Silica Nanoparticles, Luminescence, Biocompatibility

References

1 A. Cano, E. Sánchez-López, M. Ettcheto, A. López-Machado, M. Espina, E. B. Souto, R.

- Galindo, A. Camins, M. L. García and P. Turowski, *Nanomedicine*, **2020**, 15, 1239–1261.
- 2 B. Sharma and K. Pervushin, *Magnetochemistry*, **2020**, 6, 1–10.
- 3 J. Kadokawa, Ed., *Ionic Liquids - New Aspects for the Future*, InTech, Rijeka, Croatia, 2013.
- 4 C. I. Daniel, F. V Chavez, C. M. Portugal, J. G. Crespo and P. J. Sebastiao, *J. Phys. Chem. B*, **2015**, 119, 11740–11747.
- 5 A. Forte, S. Gago, M. R. Carrott, P. Carrott, C. Alves, F. Teodoro, R. Pedrosa, I. M. Marrucho
L. C. Branco, *Dalton Trans.* **2021**, <https://doi.org/10.1039/D1DT00605C>.