Radical Dendrimers. Synthesis, Characterization and Biomedical Applications

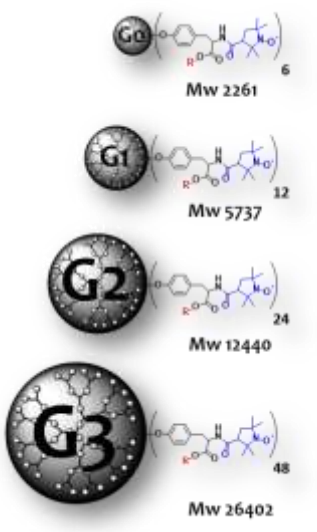
José Vidal-Gancedo, Luiz F. Pinto, Vega Lloveras

Instituto de Ciencia de Materiales de Barcelona – CSIC. Campus UAB, 08193 Bellaterra, Barcelona, Spain and CIBER – BBN, Barcelona, Spain.
j.vidal@icmab.es

Our interest is focused on the study of molecular materials based on radical dendrimers, their magnetic properties as well as their biomedical applications.[1]
Dendrimers are a very special class of hyperbranched macromolecules, which are synthesized step-by-step in order to ensure a good monodispersity. The three-dimensional structure of these molecules proceed from the central core with exponentially increasing number of repeated units and terminal groups.

The term "radical dendrimers" has been used in the case of highly functionalized dendrimers with organic radicals. Here we present a series of several generations of dendrimers built with phosphorus as branching points and with nitroxyl radicals as end groups. The interaction between pendant stable radicals at the exterior of the dendritic surface and their dynamic behaviour can be studied by Electron Paramagnetic Resonance (EPR) spectroscopy. This is important to understand the magnetic properties of these functionalized dendrimers as well as other related ones like relaxivity. The properties of the radical dendrimers depend on the core dendrimer, the size (generation of the dendrimer), the radical and the linker between the kind of radical and the dendrimer branches.

Molecules with many unpaired electrons, which possess high-spin ground state and stability at room temperature, are particularly challenging and promising targets. For example as contrast agents for Magnetic Resonance Imaging as alternative imaging probes to Gadolinium (Gd) and other metal based contrast agents to overcome their established toxicity.



References

[1] a) E. Badetti, V. Lloveras, K. Wurst, R.M. Sebastian, A.M. Caminade, J-P. Majoral, J. Veciana, J. Vidal-Gancedo, *Org. Lett*., 15 (14), 3490-3493 (**2013**). b) E. Badetti, V. Lloveras, J. L. Muñoz-Gómez, R. M. Sebastián, A. M. Caminade, J. P. Majoral, J. Veciana, J. Vidal-Gancedo *Macromolecules* 47, 7717−7724 (**2014**). c) V. Lloveras, E. Badetti, K. Wurst, J. Vidal-Gancedo *Chem. Phys. Chem.* 16, 3302-3307 (**2015**). d) V. Lloveras, E. Badetti, J. Veciana, J. Vidal-Gancedo *Nanoscale* 8, 5049-5058 (**2016**). e) V. Lloveras, F. Liko, L. F. Pinto, J.L. Muñoz-Gómez, J. Veciana, J. Vidal-Gancedo. *Chem. Phys. Chem*. 19, 1895-1902 (**2018**). f) José Vidal-Gancedo *and coll. J. Am. Chem. Soc.* (**2019**) submitted.