

Functionalized materials for imaging and supported chiral catalysts

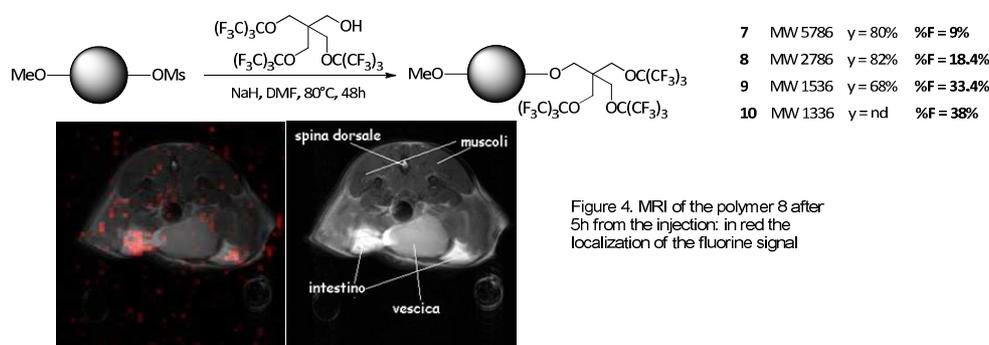
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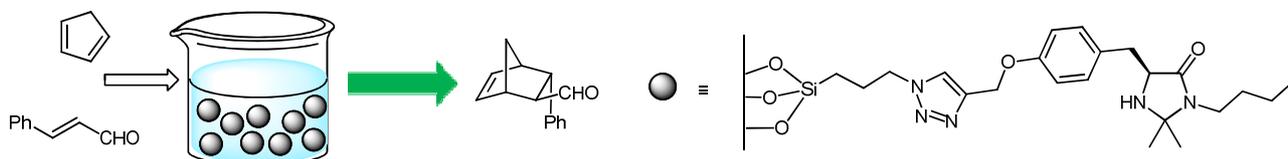
Recently we started a project aimed to the development of biodegradable polymers with controlled macromolecular architecture as **new polyfunctional agents for ^{19}F MR imaging**. The research is highly multidisciplinary, related to organic, polymer, biological, and materials chemistry. Our target is the development of novel macromolecular materials bearing a fluorinated residue suitable for ^{19}F MRI, which may be further implemented with other functions, for example a diagnostic one or, in the future, even a therapeutic one. Because of the lack of any ^{19}F background in the body, observed signals originating from injected ^{19}F containing agent exhibit an excellent degree of specificity and merging of recorded ^{19}F images on ^1H images enables an exact anatomic localization of fluorinated substances as “hot spots” [1]



The group is interested in the immobilization of chiral catalysts onto different materials and exploit their physical-chemical properties to develop recoverable and recyclable catalysts. The synthesis of chiral imidazolidinones on **mesoporous silica nanoparticles**, exploiting different anchoring sites and different linkers was reported and fully characterized by solid-state NMR, N_2 physisorption, SEM, and TGA.[2]

The immobilization of an ad hoc designed organocatalyst on iron oxide **magnetic nanoparticles (MNPs)** allowed to develop a recovery of the chiral catalyst that has been successfully performed by simply applying an external magnet to achieve a perfect separation of the MNPs from the reaction mixtures.[3] Recently, 9-Amino-9-deoxy-*epi*-quinine, properly modified by suitable linkers, was anchored on **highly cross-linked poly(styrene), poly(ethylenglycol) and silica**. The resulting species were characterized by NMR spectroscopy and tested as supported organocatalysts in the reaction between *i*-butyric aldehyde and nitrostyrene. PS- and PEG-supported catalysts outperformed their non-supported counterpart affording the desired product in high yield and ee (>90% ee).[4]

Other **chiral Hybrid Inorganic - Organic Materials** are currently under study.[5]



[1] C. Biaggi, M. Benaglia, M. Orteni, E. Micotti, C. Perego, M.-G. De Simoni *J. Fluorine Chem.*, **2013**, 153, 172.

[2] A. Puglisi, M. Benaglia, R. Annunziata, V. Chirolì, R. Porta, A. Gervasini, *J. Org. Chem.*, **2013**, 78, 11326.

[3] S. Mondini, A. Puglisi, M. Benaglia, D. Ramella, C. Drago, A. M. Ferretti, A. Ponti, *Journal of Nanoparticles Research*, **2013**, 15, 2025.

[4] R. Porta, F. Coccia, R. Annunziata and A. Puglisi, *ChemCatChem.*, **2015**, accepted.

[5] V. Chirolì, M. Benaglia, F. Cozzi, A. Puglisi, R. Annunziata, G. Celentano, *Org. Lett.*, **2013**, 15, 3590.