P-007	**Amphiphilic dendrimers for encapsulation of transition metal Complexes**	

Bouquillon, S. *[#] ; Balieu, S. ; Gatard, S. ; Dupont, L.
ICMR, Université Reims Champagne Ardenne France
sandrine.bouquillon@univ-reims.fr

INTRODUCTION AND OBJECTIVES

The D-xylose and L-arabinose, derived from renewable agricultural resources, are building blocks of choice for the formation of various molecules with a broad spectrum of application. In a first approach, from the pentoses, we have prepared single-chain or bicatenar surfactants (Muzart 2001, Estrine 2004, Estrine 2005, Hadad 2006, Damez 2007, Pradeau 2008, Bouquillon 2010, Deleu 2011). Recently, we have chosen to valorize these sugars *via* the preparation of silicon- or phosphorus-based glycodendrimers amphiphilic having a chiral surface (Camponovo 2009, Hadad 2009, Gatard 2011). Thus, these compounds possess the particularity to behave as micelles for a possible use in biphasic enantioselective catalysis or encapsulation field.

MATERIALS AND METHODS

PolyPropyleneImines (PPIs) and glycerol carbonate were used as starting materials. Classical methods of organic synthesis were employed (see conditions on figure 1). The purification of glycerodendrimers was realized by precipitation or dialysis experiments. Analyses were performed by NMR, DOSY NMR, IR, mass spectroscopy, elemental analysis, ICP AES and relaxivity experiments.

RESULTS AND DISCUSSION

The modification of nitrogen-based dendrimers (Balieu 2010, Balieu 2011) was performed by grafting hydrophilic entities derived from glycerol carbonate. The syntheses were realized with good to excellent yields and 5 generations of glycerodendrimers were prepared (figure 1).

After fully characterization of them, considering the dendrimer sizes (Figure 2), it was evident to study the capacity of complexes encapsulation of only GD-PPI-4 and GD-PPI-5.

In order to investigate the container properties of the GD-PPI glycerodendrimers, their encapsulation ability was tested towards various metal chelates (figure 3).

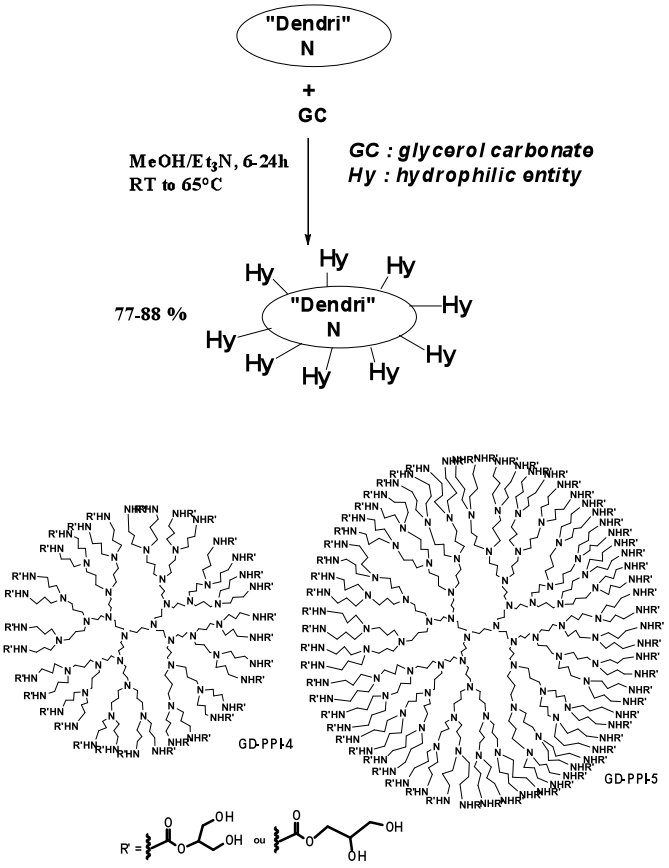

Figure 1: Synthesis of glycerodendrimers

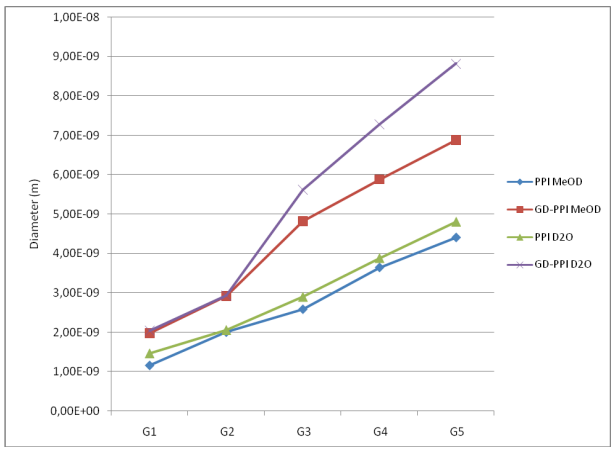

Figure 2: Dendrimer size evaluated by DOSY experiments

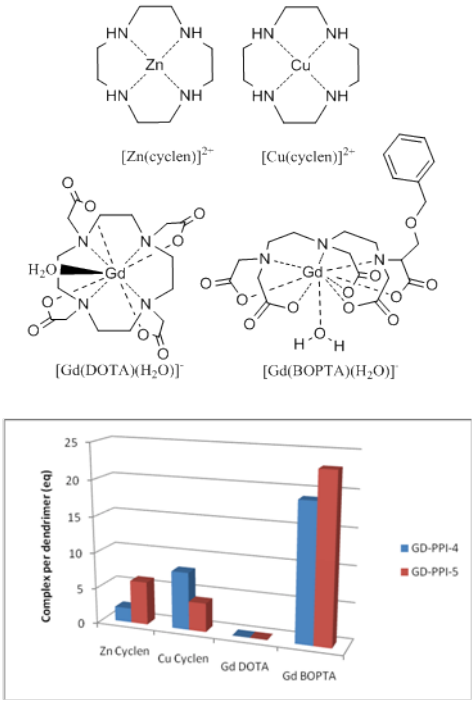

Figure 3: Encapsulation results

Dendrimer's cytotoxicity was tested using MRC5 fibroblasts and as expected, the grafting hydrophilic entities led to a decrease in their toxicity.

CONCLUSIONS

PolyPropyleneImines (PPIs) functionalized by glycerol-based entities were synthetized and fully characterized. Showing low cytotoxicity against MRC5 fibroblasts, their encapsulation capacities were evaluated towards copper, zinc and gadolinium complexes. T1 measurements were performed to determine the relaxivity of the encapsulated GdBOPTA in dendrimers of fourth and fifth generation (GD-PPI-4 and GD-PPI-5). Comparison of the GdBOPTA relaxivity and the relaxivity of GdBOPTA loaded dendrimers showed a slight increase of the gadolinium chelate relaxivity.

REFERENCES

- Muzart, J. and al. (2001) « Procédé de préparation de composés tensio-actifs à partir de polyols » *Brevet Français CNRS* N° 0116363**,** PCT WO 03053987.
- Estrine, B. and al. (2004) "Telomerization of butadiene with L-arabinose and D-xylose in DMF for the selective formation of monooctadienylglycosides" *Eur. J. Org. Chem.* 2914.
- Estrine, B. and al. (2005) "Telomerization of butadiene with pentoses in water: Selective etherifications" *Green. Chem.* 7 219.
- Hadad, C. and al. (2006) "Neutral glycosides surfactants issued from the butadiene telomerization with pentoses: synthesis and amphiphilic properties" *Carbohydr. Res.* 341 1938.
- Damez, C. and al. (2007) "Alkenyl and alkenoyl amphiphilic derivatives of D-xylose and their surfactant properties" *Carbohydr. Res.* 342 154.
- Pradeau, S. and al. (2008) "Phosphorylation of mono- or di-octadienyl-D-xylosides. Influence towards surfactant properties" *Tenside Surfact. Det.* 6(45) 320.
- Bouquillon, S. and al. (2010) *Top. Curr. Chem.* 1.
- Deleu, M. and al. (2011) "Synthesis and physicochemical characterization of bolaamphiphiles derived from alkenyl D-xylosides" *New J. Chem.* in press.
- Camponovo, J. and al. (2009) "Click Glycodendrimers containing 27, 81 and 243 modified xylopyranoside termini" *J. Org. Chem.* 74 5071.
- Hadad, C. and al. (2009) "First phosphorous D-xylose-derived glycodendrimers" *Tetrahedron Lett.* 50 1902.
- Gatard, S. and al. (2011) "Water-soluble glycodendrimers: synthesis and stabilization of catalytically active Pd and Pt nanoparticles" *Tetrahedron Lett.* 52 1842.
- Balieu, S. and al. (2010) "One-step surface secoration of poly(propyleneimines) (PPIs) with the glyceryl moiety: new way for recycling homogeneous dendrimer-based catalysts" *Adv. Synth. Cat.* 352 1826.
- Balieu, S. and al. (2011) "New Dendrimers for Encapsulation of Contrast Imaging Agents" *Tetrahedron* Submitted.