

Synthesis of a new series of phosphorus dendrimers

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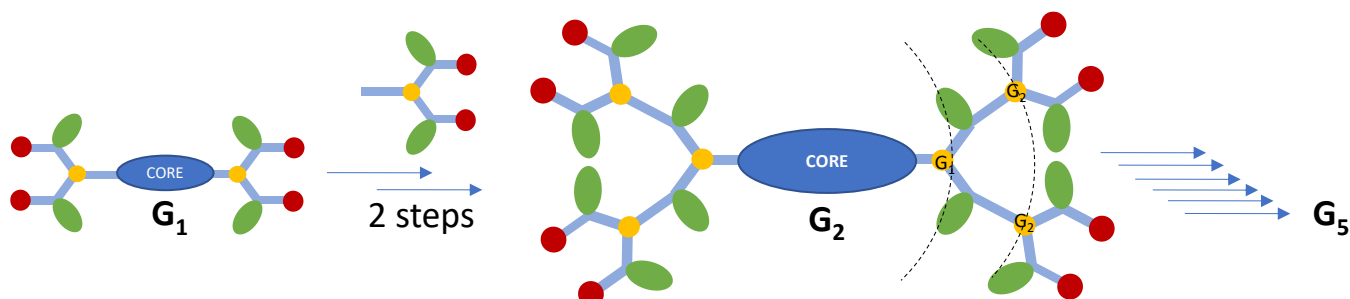
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Dendrimers are perfectly designed and highly branched macromolecules with a globular 3D shape. A dendrimer is made of a core, attach to the core are branches and at the end of branches are terminal functions. The synthesis of dendrimers follows iterative processes.

Since the first neutral phosphorus dendrimers were reported in 1994¹, the number of patents and publications in this field has grown exponentially. The thiophosphohydrazone (PPH) skeleton designed and reported by Caminade's team in France has been thoroughly studied. This family of dendrimers offers a very wide range of applications² in fields like biology³, materials and catalysis. However, because of the nature of the skeleton, PPH dendrimers maybe prone to undergo hydrolytic degradation at the hydrazone function, even at physiological pH. This drawback is possibly among the reasons why PPH dendrimers did not have a successful industrial fate.

To answer this problem, we have developed a new kind of phosphorus dendrimers based on a thiophosphoramidate skeleton (PTPAm). These new dendrimers series were prepared up to the fifth generation. The stability in water at various pH values was found to be dramatically increased in the case of polyanionic dendrimers. Moreover, the highly versatile synthetic approach is compatible with large-scale production and offers a wide range of modifications that are really helpful for layer-block approaches and multifunctional molecular platforms.



- (1) Launay, N.; Caminade, A.-M.; Lahana, R.; Majoral, J.-P. A General Synthetic Strategy for Neutral Phosphorus-Containing Dendrimers. *Angewandte Chemie International Edition in English* **1994**, *33* (15–16), 1589–1592.
- (2) Caminade, A. M.; Turrin, C. O.; Laurent, R.; Ouali, A.; Delavaux-Nicot, B. *Dendrimers: Towards Catalytic, Material and Biomedical Uses*; Wiley, 2011.
- (3) Caminade, A. M.; Turrin, C. O.; Majoral, J. P. *Phosphorous Dendrimers in Biology and Nanomedicine: Syntheses, Characterization, and Properties*; Jenny Stanford Publishing, 2018.