Macromolecular Porphyrin Nanostructures

P.de Witte, M. Lensen, D. Vriesema, J. Foekema and R.J.M. Nolte, **Alan E. Rowan**

Department of Organic Chemistry, Nijmegen SON Research Center, University Nijmegen, Toernooiveld 1, 6525 ED Nijmegen, The Netherlands.

The design and construction of novel porphyrin architectures in particular well defined porphyrin arrays, is an area of increasing current interest. These porphyrin assemblies are of fundamental importance not only as models for the study of light harvesting antenna and the photosynthetic reaction centers but also as building blocks for the construction of functional molecular devices, i.e. molecular scale wires, switches and photo voltaic devices, etc. In the case of the natural antenna systems the function and properties of the chromophoric arrays are controlled by the spatial arrangement and orientation of the molecules which themselves are held in a specific architecture through predominantly non-covalent interactions within a protein and carotenoid scaffold. The first step toward mimicking the properties of such systems is the development of techniques, which enable the construction of precisely-defined multi-chromphoric arrays.

We have recently developed several approaches toward the construction of such assemblies of chromophores moieties into nanometer-sized architectures. Three building blocks which are currently being developed are:-

a) Porphyrin gluconamides, which self-assemble to form well defined helical porphyrin fibers and organogels.
b) Polyisocyanide-porphyrinato arrays which possess nanometer long stacks of precisely aligned chromophores.
c) Dendritic-like hexakis-porphyrinato and dodecameric benzenes macromolecules which can be assembled into highly ordered ‘nano wheels’.

The development of these three building blocks and the properties of the resulting assemblages will be presented.