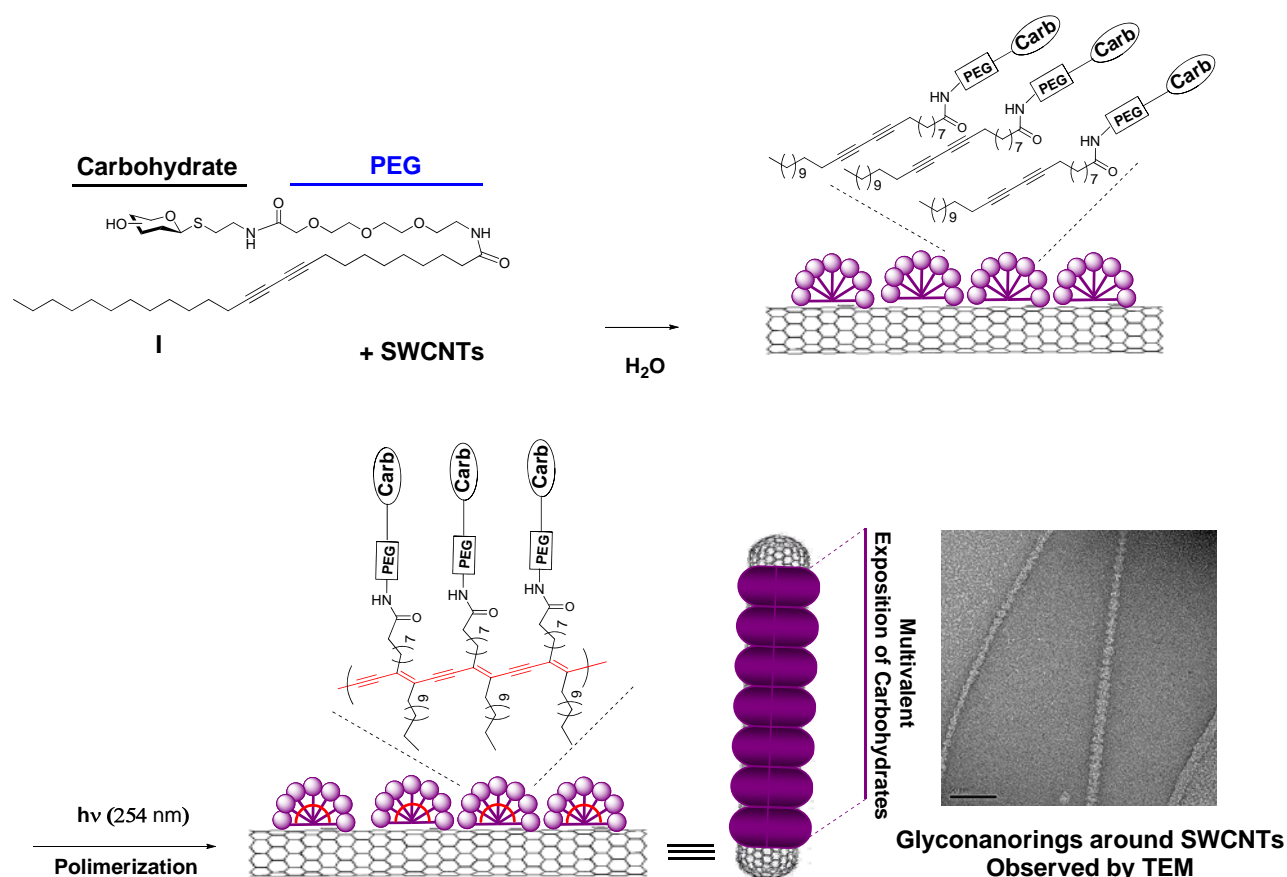


Bioengineering of Carbon Nanotubes: Glyconanoabacus with Biomimetic Display of Carbohydrates

N. Khiair,^{*1} M. Assali,¹ M. Pernía,¹ R. Baati,² R. Recio,³ I. Fernández,³ and C. Mioskowski.²

¹ Instituto de Investigaciones Químicas, CSIC, c/. Américo Vespucio, 49, Isla de la Cartuja, 41092- Seville. Spain. ² Laboratoire de Synthèse Bio-Organique, Faculté de Pharmacie, 74, route du Rhin BP 60024. 67401 Illkirch-Graffenstaden, Strasbourg. France. ³ Dpto. Química Orgánica y Farmacéutica, Facultad de Farmacia, Universidad de Sevilla, 41012-Seville. Spain. e-mail: Khiair@iiq.csic.es

Single-walled carbon nanotubes (SWCNTs) are interesting 1D nanomaterials endowed with unique size shape and physical properties that make them promising candidates for biomedical applications.¹ Nevertheless, advances in these directions have been very slow as SWCNTs are insoluble in most organic solvents, specifically in water. In the present work, we present our results on the utilisation of carbon nanotubes as molecular jig or platform for a multivalent presentation of saccharide epitopes, and for the generation of new biologically relevant nano-objects.² Our approximation is based on the supramolecular self-organization of neoglycolipids such as **I**, on the nanotube surface giving rise to rings made of rolled-up half cylinders, Scheme 1.³ As a consequence, water soluble, highly stable aggregates were obtained, where the physical and electronic characteristics of SWCNTs are preserved.



Scheme 1

Photopolymerisation of the diacetylene function upon ultraviolet irradiation (254 nm) affords a conjugated polydiacetylene backbone of alternating enyne groups, a known colorimetric biosensor, which rigidifies the rings around the SWCNT. In the present communication, the following points will be discussed: (i) the modular synthetic strategies developed for the synthesis of tailored amphiphilic neoglycoconjugates, (ii) the determination of the neoglycolipid structural requirements for an efficient interaction and solubilization of SWCNTs, (iii) the determination of the type and shape of the supramolecular self-organization of the neoglycolipids on the SWCNTs surface, and (iv) the preliminary studies of the selective binding of SWCNT-neoglycoconjugate with specific biological receptors.

- 1) Liu, Z. ; Davis, C. ; Cai, W. ; Chen, X. ; Dai, H.J. *Proc. Natl. Acad. Sci. U.S.A.* **2008**, *105*, 1410.
- 2) Assali, M.; Pernía Leal, M.; Fernández, I.; Baati, R., Mioskowski, C.; Khier, N. *Soft Matter*, **2009**, *5*, 948.
- 3) Khier, N.; Pernia Leal, M.; Baati, R.; Ruhlmann, C.; Mioskowski, C., Schultz, P.; Fernández, I. *Chem. Commun.* **2009**, 4121.