ChemPlusChem, 2015

# A Hetero-Bifunctional Spacer for the Smart Engineering of Carbon-Based Nanostructures

Tuci G., Luconi L., Rossin A., Baldini F., Cicchi S., Tombelli S., Trono C., Giannetti A., Manet I., Fedeli S., Brandi A., Giambastiani G.

*Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia*

## Abstract

© 2015 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim. Efforts have been made in recent years to develop novel functionalisation protocols aimed at imparting multimodality and improved properties to complex carbon-based nanostructures. The incorporation of cleavable bonds to the nanomaterial surface for the controlled release (or exchange) of specific molecules under appropriate chemical and biological settings is relatively unexplored. The design and synthesis of a hetero-bifunctional linker joining a "cleavable" disulfide moiety for the covalent anchoring of a wide range of thiol end-capped (bio)molecules and a "clickable" terminal acetylene group is described. The strategy is based on the well-established copper-mediated acetylene-azide coupling reaction between the acetylene linker and single-walled carbon nanotubes decorated with phenylazido pendant arms. As a result, easily "post-derivatisable" and traceable nanostructured platforms containing a linking group potentially available for a wide range of biological probes are prepared and completely characterised. Building on solid foundations: A hetero-bifunctional linker joining a "cleavable" disulfide moiety and a "clickable" terminal acetylene group was synthesized and used to decorate carbon nanotubes (CNTs). When used in combination with other selected terminal acetylene molecules, the linker can impart multimodality through a controlled click reaction to give carbon nanohybrids (see figure).

http://dx.doi.org/10.1002/cplu.201402391

## Keywords

Carbon, Click chemistry, Drug delivery, Nanotubes, Synthesis design