Click chemistry: new route to functional hybrid silicas

Michel Wong Chi Man

Institut Charles Gerhadt Montpellier,CNRS- ENSCM-UM, Montpellier, France

Functional hybrid silicas are interesting materials that can be applied in many areas of research: optics, coatings, drug delivery or supported catalysis. Two routes are mainly used to prepare these materials:

- grafting a functional silane on a silica surface

- sol-gel hydrolysis of the functional silane precursor.

Organotrialkoxysilanes are key precursors for their synthesis and many functional alkoxysilanes are commercially available such as mercaptopropyltriethoxysilane, aminopropyltriethoxyslane and n-alkyltriethoxysilane are the most commonly used to improve adhesion, abrasive strength, water repellency, etc… Most of these silanes can further be post-functionalised with other groups but the reactions are not very clean and the purification of the products is often tedious. Organotrialkoxysilanes are moisture-sensitive and thus reactions that can be performed under anhydrous conditions to afford the compounds with easy purification steps are desired. The recent development of the copper-catalyzed alkyne azide cycloaddition reaction (CuAAC) in bio-organic, polymer and materials chemistry prompted us to envisage its use to link an organic function bearing a terminal triple bond with an azido-alkyltriethoxysilyl moiety using this click reaction.[1, 2] With microwave activation, a very fast and selective method was developed to produce organotrialkoxysilanes in quantitative yield and with high purity upon only simple extraction and filtration workup procedures. The triethoxysilyl groups could be linked to challenging substrates, allowing the formation of new types of organotriethoxysilanes. In this presentation, we will describe the scope of two retrosynthetic approaches. In particular, we will focus on triethoxysilyl substrates containing functionalities (azide or terminal alkyne) that can undergo click reactions to give new functional organosilanes, precursors of hybrid silicas that can be used for several interesting applications such as optics, sensors, catalysis and drug carriers/delivery.

Keywords: Click Chemistry, hybrid silica, silsesquioxanes, sol-gel

References:

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