CLICK CHEMISTRY AS A SMART STRATEGY FOR THE SITE SPECIFIC CHEMICAL FUNCTIONALIZATION AND NANOSTRUCTURATION OF POROUS MONOLITH SURFACE

Mohamed GUERROUACHE,1 Samia MAHOUCHE-CHERGUI,1 Mohamed M. CHEHIMI,2 Benjamin CARBONNIER1

1 University Paris-East Créteil, ICMPE, UMR CNRS 7182, 2-8, rue Henri Dunant, 94320, Thiais, France
2 University Paris Diderot, Sorbonne Paris Cité, ITO DYS, UMR CNRS 7086, 15 rue J-A de Baïf, 75013 Paris, France
*carbonnier@icmpe.cnrs.fr

Combining metallic structures with length scales in the nanometer range with organic polymers provides fascinating opportunities for the design of smart heterostructures with applications in various scientific and technological fields.1 Considering porous polymer containing metal nanoparticles (MNPs), the mostly applied preparation pathway involves the immobilization of MNPs on the pores surface of pre-formed polymers. This approach proved particularly efficient for macroporous polymers with an interconnected network of pores, namely monoliths, allowing for a dynamic loading with colloidal solution of MNPs. Moreover, adsorption behaviour of MNPs can be controlled by adjusting the surface functionality of porous monolith via either a judicious choice of monomers, or post-polymerization functionalization.2 Indeed, using classical organic reactions, such as the epoxide ring opening, surface grafting of amino or thiol groups has been successfully achieved allowing the further immobilization of gold nanoparticles (GNPs). With this approach, good and homogeneous composites can be produced, but control over the spatial distribution of the GNPs was not considered. In this contribution, we will demonstrate that this gap can be filled spatially controlled surface functionalisation of pore surface.3 To establish the method, monolith surface with alkyne functionality was reacted with cysteamine through thiol-yne addition reaction providing hydrophilic and chelating interface. Photochemical initiation affords spatial control over the reaction site and further site-specific immobilisation of gold nanoparticles. Implementation of Huisgen,4 thiol-ene,5 and diels-alder click-type reactions will also discussed for the surface grafting of molecular and oligomeric units. This work undoubtedly highlights click-surface chemistry as a powerful surface modification strategy for spatial control, at the molecular level, the chemical nature of pores surface.

References