Responsive Janus inorganic / polymeric hybrid particles and their self-assembly

Rapports

Informations projet

Janus Hybrids

N° de convention de subvention: 274410

Projet clôturé

Date de début
1 Septembre 2011

Date de fin
31 Août 2013

Financé au titre de
Specific programme "People" implementing the Seventh Framework Programme of the European Community for research, technological development and demonstration activities (2007 to 2013)

Coût total
€ 246 855,00

Contribution de l'UE
€ 246 855,00

Coordonné par
UNIVERSITEIT TWENTE
Netherlands

Final Report Summary - JANUS HYBRIDS (Responsive Janus inorganic / polymeric hybrid particles and their self-assembly)

Could particles change their morphology and perform functions by a response to the environment, similar to proteins? This project has provided this possibility by engineering responsive Janus inorganic/polymer hybrid particles with a changeable morphology. The project has focused on developing the (large-scale)

synthesis routes, and the properties and applications of the resulting particles.
The research has resulted in new methods of preparing two kinds of Janus particles in one-pot: Janus copolymer particles and Janus inorganic/polymer hybrid particles (Figure 1a-b). Their structure, composition and size were investigated, and the ratio of every compartment could be tuned. The morphology of Janus copolymer particles was changed under different conditions such as solvent (Figure 1c-d), and this responsiveness of the Janus copolymer particles has resulted in a regular arrangement of the particles on a substrate. At the same time, the assembly on the surface clearly visualized the Janus structure of the particles. In addition, the responsiveness of the Janus hybrid particles was investigated as well, which has resulted in their controlled aggregation.

Figure 1. Janus particles and their morphology changes: a) Janus copolymer particles; b) Janus hybrid particles; c,d) Morphology changes of Janus copolymer particles

Applications of the Janus particles were investigated as well. The Janus hybrid particles could be modified further by applying chemical strategies that provided selective functionalization of one of the phases. In this way, they could self-assemble on a metal surface to produce a smart, responsive hybrid surface, and they underwent controlled self-assembly using host-guest interactions by equipping the particles with biotin groups and aggregating them with streptavidin (Figure 2). Additionally, they were found to emulsify a mixture of oil and water, and the resulting emulsion could be switched between oil-in-water and water-in-oil. The emulsification also resulted in a new method to prepare hollow spheres. The hybrid particles were also used as a catalyst support, and the as-prepared catalysts performed well in the nitrite hydrogenation.

Figure 2. Self-assembly of Janus hybrid particles via host-guest interactions

Documents connexes

final1-publicsummary-janus-hybrids.pdf

Dernière mise à jour: 25 Juillet 2014

Permalink: https://cordis.europa.eu/project/id/274410/reporting/fr