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Cover Profile

Extending Surface-Enhanced Raman Spectroscopy to Liquids Using Shell-Isolated Plasmonic Superstructures


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Invited for the cover of this issue is the group of Bert M. Weckhuysen at Utrecht University. The image on the cover shows SHIPS, shell-isolated plasmonic superstructures, detecting the presence of picomoles Rhodamine 6G in an aqueous solution using shell-isolated nanoparticle-enhanced Raman spectroscopy (SHINERS). Read the full text of the article at 10.1002/chem.2019032004.

What prompted you to investigate this problem?

We wanted to create new plasmonic superstructures because the application of SHINERS in solid-liquid phase heterogeneous catalysis is still lacking. Due to the requirement of hot spots, created by the placement of plasmonic nanoparticles in very close proximity to each other, these plasmonic superstructures needed to be able to support plasmonic nanoparticles, while remaining small enough to form a stable dispersion. The resulting SHIPS consist of large silica spheres onto which plasmonic Au nanoparticles are adsorbed. Whereas the Inorganic Chemistry and Catalysis group at Utrecht University (Katinka Wondergem, Thomas van Swieten, Robin Geitenbeek, Bert Weckhuysen) has solid experience with heterogeneous catalysis, as well as plasmonic nanoparticles, the Physical and Colloid Chemistry group at Utrecht University (Thomas van Swieten, Ben Erné) has ample experience with (silica) colloids and their characterization methods, making for a perfect fit for a fruitful collaboration on this topic.

Does the research open other avenues that you would like to investigate?

With these new, stable SHIPS dispersions, the next step will be their application for fundamental solid-liquid phase heterogeneous catalysis research in various fields of applications. We are currently investigating the potential of these SHIPS for monitoring enhanced Raman spectroscopy in homogeneous catalysis, as well as liquid-phase biomass and waste conversion. The developed SHIPS might also prove useful for the emerging area of (photo-)electrocatalysis.

What was the inspiration for this cover design?

The cover is inspired by the acronym for our Raman signal-enhancing superstructures: SHIPS. A submarine is some sort of "underwater ship" and in this case has search lights looking for the presence of treasure, or molecules of Rhodamine 6G. Katinka Wondergem came with the concept of the cover, and Dr. Thomas Hartman, a postdoctoral fellow working on SHINERS in the group of Bert Weckhuysen created the cover image. During his Ph.D., also in the group of Prof. Weckhuysen, Thomas discovered his talent for digital art and as such has already designed several journal covers.

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