

NEWS | NOVEMBER 29 2019

The role of trapped water on electroresponsive microspheres is revealed

Savannah Mandel



Scilight 2019, 481101 (2019)

<https://doi.org/10.1063/10.0000309>

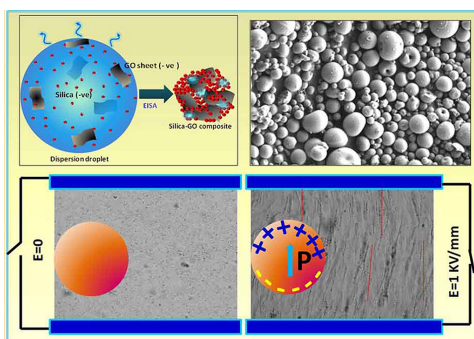


25 November 2019

The role of trapped water on electroresponsive microspheres is revealed

Savannah Mandel

Scientists develop a scalable and easy approach to achieve electroresponsive microspheres through evaporation-induced assembly.



Electroresponsive microspheres can be used as lubricant additives and in electroresponsive fluid applications. Usually, creating electroresponsive microspheres through conventional methods involves complex chemical synthesis.

A method of achieving electroresponsive microspheres through evaporation-induced assembly was developed by Bahadur et al. This scalable and straightforward method offers insights into the electroresponsiveness of silica-graphene oxide (GO) composite microspheres and how to modify electroresponsiveness for specific applications. As well, the authors use evaporation-induced assembly because it could isolate GO sheets in the silica matrix, limiting the stacking of the sheets.

The authors found that trapped water in the microspheres interacted with oxygen-containing functional groups anchored on the GO sheets, affecting their electroresponsive behavior.

“The adsorbed water in the interstices, owing to the nano-confinement, enhances the effective dielectric constant of the microspheres and hence results in strong electroresponse in such microspheres,” said Bahadur.

They used small-angle X-ray/neutron scattering, electron microscopy, Raman spectroscopy, infrared spectroscopy and differential scanning calorimetry to probe the hierarchical structure of the microspheres and the nature of trapped water responsible for electroresponsive behavior. By understanding the hierarchical structure of the microspheres, researchers can establish their structure-function correlation and learn information such as their packing fraction, stability and size distribution.

The authors intend on furthering this research in several ways. They plan to perform a detailed study to probe the electroresponse of the silica-GO composite microspheres as a function of adsorbed water content, applied electric field and microsphere concentration. In addition, they hope to examine the tribological property of the microspheres for lubricant additive application.

Source: “Role of trapped water on electroresponsive characteristic of silica-graphene oxide composite microspheres,” by Jitendra Bahadur, Avik Das, Jyoti Prakash, Pankaj Singh, Arshad Khan, and Debasis Sen, *Journal of Applied Physics* (2019). The article can be accessed at <https://doi.org/10.1063/1.5124910>.

Published by AIP Publishing (<https://publishing.aip.org/authors/rights-and-permissions>).