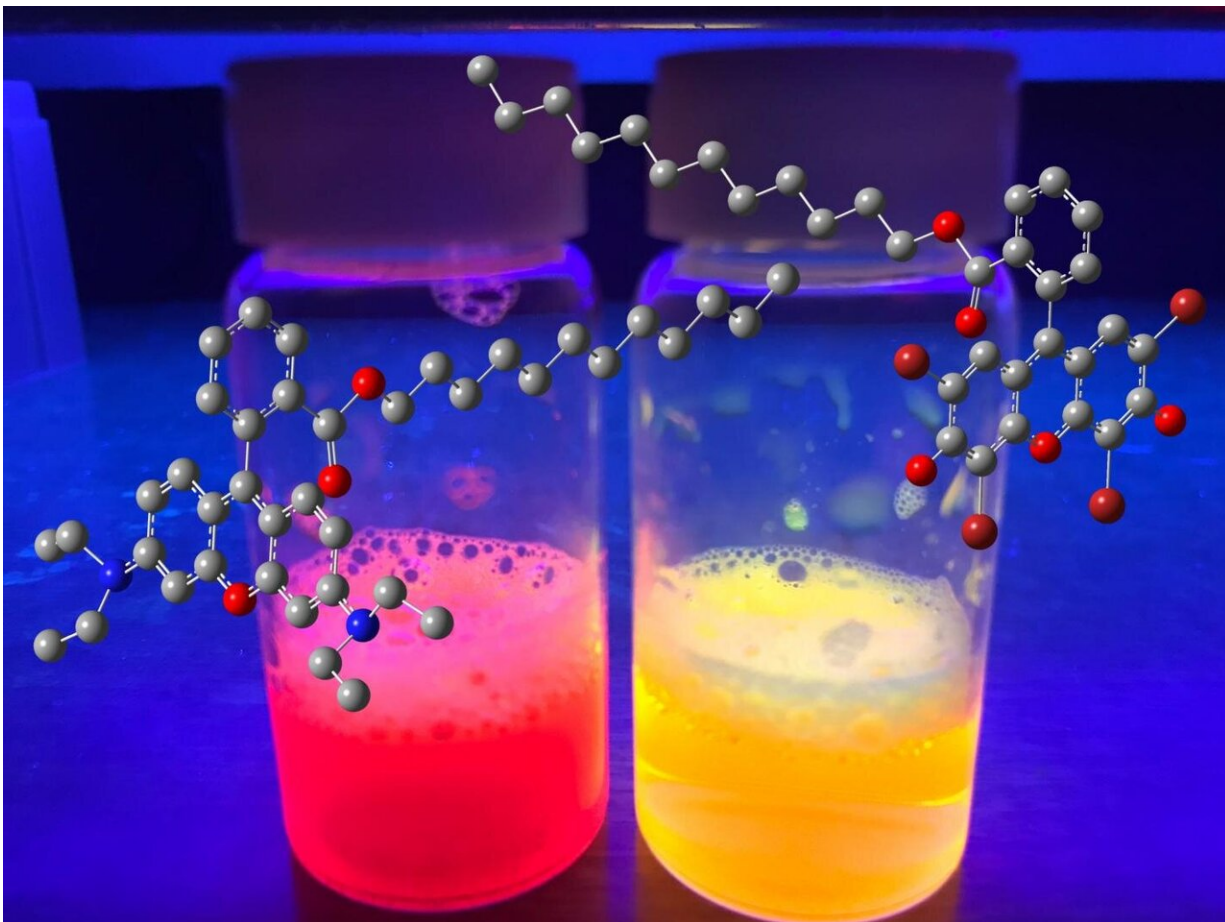


Lab produces simple fluorescent surfactants

August 5 2019, by Mike Williams



Rice University chemists have produced an array of fluorescent surfactants for imaging, biomedical and manufacturing applications. Credit: Ashleigh Smith McWilliams/Rice University

Laboratories use surfactants to separate things, and fluorescent dyes to

see things. Rice University chemists have combined the two to simplify life for scientists everywhere.

The Wiess School of Natural Sciences lab of chemist Angel Martí introduced a lineup of eight fluorescent surfactants in *Pure and Applied Chemistry*. They're examples of what he believes will be a modular set of fluorescent surfactants for labs and industry.

Martí and Rice graduate student and lead author Ashleigh Smith McWilliams developed the compounds primarily to capture images of single nanotubes or [cells](#) as simply as possible.

"We can stain cells or carbon nanotubes with these surfactants," Martí said. "They stick to cells or nanotubes and now you can use fluorescent microscopy to visualize them."

Soaps and detergents are common surfactants. They are two-part molecules with water-attracting heads and water-avoiding tails. Put enough of them in water and they will form micelles, with the heads facing outward and the tails inward. (Similar structures form the protective, porous barriers around cells.)

McWilliams produced the surfactants by reacting [fluorescent dyes](#) with alcohol-based, nonpolar tails, which made the heads glow when triggered by visible light. When the compounds wrap around carbon nanotubes in a solution, they not only keep the [nanotubes](#) from aggregating but make them far easier to see under a microscope.

"Surfactants have been used for many different applications for years, but we've made them special by converting them to image things you can generally not see," Martí said.

"Fluorescent surfactants have been studied before, but the novel part of

ours is their versatility and relative simplicity," McWilliams said. "We use common dyes and plan to produce these surfactants with an array of colors and fluorescent properties for specific applications."

Those could be far-reaching, Martí said.

"These can go well beyond imaging applications," he said. "For instance, clothing manufacturers use surfactants and dyes. In theory, they could combine those; instead of using two different chemicals, they could use one.

"I can also envision using these for [water purification](#), where [surfactant](#) dyes can be tuned to trap pollutants and destroy them using visible light," Martí said. "For biomedical applications, they can be tuned to target specific cells and kill only those you radiate with light. That would allow for a localized way to treat, say, skin cancer."

Martí said his lab was able to confirm fluorescent surfactants are the real deal. "We were able to characterize the critical micelle concentration, the concentration at which micelles start forming," he said. "So we are 100% sure these molecules are surfactants."

More information: Ashleigh D. Smith McWilliams et al, Fluorescent surfactants from common dyes – Rhodamine B and Eosin Y, *Pure and Applied Chemistry* (2019). [DOI: 10.1515/pac-2019-0219](https://doi.org/10.1515/pac-2019-0219)

Provided by Rice University

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