Tunable nano-suspensions for light harvesting

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A Syracuse University researcher has developed a patent-pending robust process to manufacture stable suspensions of metal nanoparticles capable of capturing sunlight.

Radhakrishna Sureshkumar, professor and chair of biomedical and chemical engineering in Syracuse University's L.C. Smith College of Engineering and Computer Science, and professor of physics, has developed a patent-pending robust process to manufacture stable suspensions of metal nanoparticles capable of capturing sunlight. By changing the composition of the suspension, the researchers can "dial in" to a given wavelength (color) of the spectrum. The American Institute of Physics published Sureshkumar's research in Applied Physics Letters in July 2011 and his work will be presented at the SPIE Optics + Photonics conference on August 23.

Sureshkumar's utilized suspensions containing different types or a mixture of metal nanoparticles capable of interacting with different wavelengths of the visible spectrum through a phenomenon referred to as "plasmon resonance". When nanoparticles are introduced into a solution, their natural tendency is to agglomerate and settle down to the bottom of the solution. Hence, such suspensions are inherently unstable. This key challenge was overcome by Sureshkumar and coworkers by employing micelle fragments to act as bridges between nanoparticles thus holding them in place.

Along with LCS graduate students Tao Cong, Satvik Wani and Peter

Paynter, Sureshkumar worked with Brookhaven National Laboratory's Center for Functional Nanomaterials to characterize the nano-suspensions using small angle x-ray scattering (SAXS) experiments to confirm their ability to create optimal nanoparticle dispersions with tunable optical properties.

"Several applications for this research can be envisioned within the energy field. For instance, the suspensions could be used as precursors to create coatings that improve the light trapping efficiency of thin film photovoltaic devices. Another application would be in the manufacturing of multifunctional smart glasses for building windows that generate energy from the visible range while blocking harmful ultraviolet (UV) rays."

Provided by Syracuse University

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