

MULTI-FUNCTIONAL NANOMATERIALS BY SURFACTANT-ASSISTED FABRICATION

US Pat. No. 8,871,926 (additional patents pending)
Technology Readiness Level: 3
Concept demonstrated analytically or experimentally

Due to current manufacturing methods, nanomaterials suffer from a lack of uniformity resulting in efficiency and reliability issues. Sandia National Laboratories developed an innovative crystallization method that produces well-defined multi-functional nanomaterials.

Sandia's nanomaterials are produced using a seeding and growing process within surfactant-confined nanostructures (micelles, emulsions, and mesophases). This process provides unique control over shape, size, composition, and reproducibility—currently unachievable with traditional manufacturing methods. This process also provides the ability to adjust chemical and physical nature of nanomaterials at different crystallization stages, enabling further tunability to achieve desirable functions and properties.

Sandia has used this method to successfully produce a wide variety of nanomaterials such as porphyrins, energetic materials, and nanoparticles. The functional materials produced through this process exhibit superior performance at a fraction of the cost in important applications including photo-degradation of organic pollutants, photocatalytic hydrogen production, synthesis of fuel cell catalysts, and phototherapy in comparison with existing catalysts.

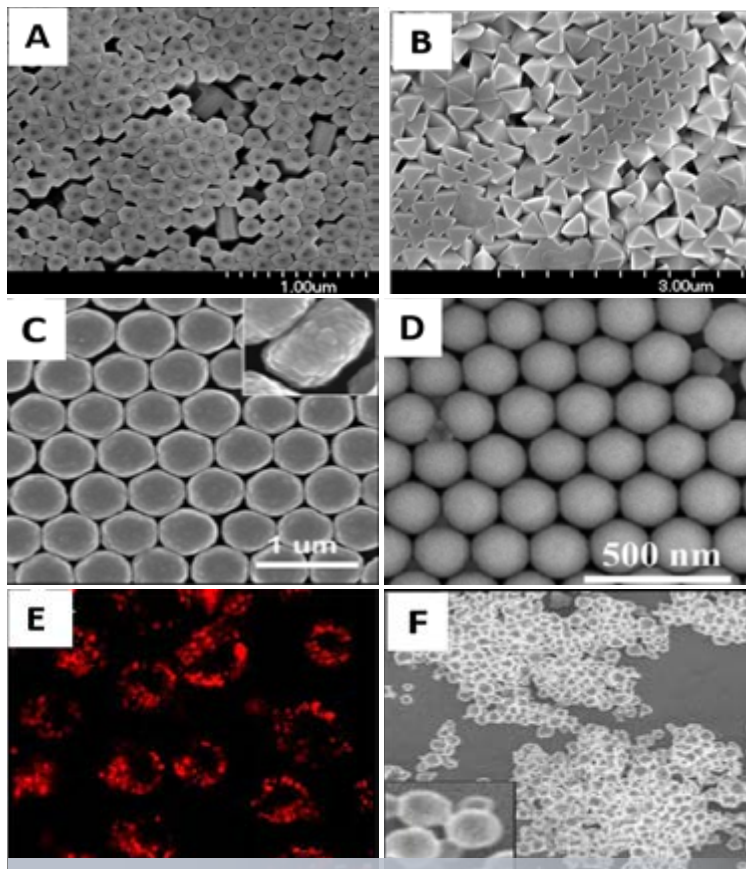


Image A & B: templated by surfactant micelles, Image C & D: nanospheres templated by emulsion, Image E: particles templated by micellar networks for phototherapy, and Image F: energetic materials (CL-20) confined by micelle/emulsions

TECHNICAL BENEFITS

- Cost effective manufacturing method
- Improved performance & reliability
- Scalable production
- Environmentally benign process
- Ability to create novel particle shapes
- Uniform shape, size, and composition

INDUSTRIES & APPLICATIONS

- Photo-degradation of organic pollutants
- Photocatalytic hydrogen production
- Synthesis of fuel cell catalysts
- Phototherapy

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