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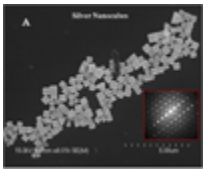
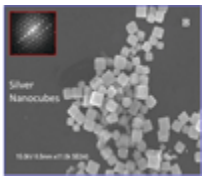
Synthesis of silver nanocubes in home microwave oven

Using polymers as molecular templates to organize and synthesize nanomaterials is an attractive principle for making inexpensive microelectronics. The polymer matrix serves as a mediator to form the structure and as a binder for easy processing. Recently, Saraf's lab at the University of Nebraska-Lincoln has synthesized monodispersed nanoparticles templated on polymers (*Langmuir* 2006), aligned nanoparticles in the form of necklaces on a polymer chain that exhibit electron transport at a sensitivity of a single electron charging (*Advanced Materials* 2008) and organized nanoparticles by self-assembly on polymers to make an electronic skin with a sensitivity on par with the human finger (*Science* 2006).

In this report, Kundu *et al*. describe a one-step process to make nanocubes by simply heating a mixture of polymer solution, a nucleating agent and salt in a home microwave oven for less than two minutes. Using a simple salt of silver and ~5?nm gold nanoparticles as the nucleating agent in an aqueous solution of sulphonated polystyrene, the team demonstrated the synthesis of 300–400?nm metal nanocubes. The key discovery was the realization that the polymer matrix controls the growth of the crystal in a specific crystallographic direction during microwave heating to obtain single crystalline particles.



The process seems to have broad application. For example, preliminary results indicate that it is possible to synthesize triangular and hexagonal prisms of gold with a similar strategy. These faceted nanoparticles will add to the plethora of nanoparticle-based applications being developed for electronics and biology. The high curvature at the edges of faceted nanostructures, for example, can enhance catalytic activity of the particle or provide pinning of the magnetic domains to attain higher coercivity magnetic material at the nanoscale for ultrahigh density storage media.



The key to future development is in creating other chemistries involving different polymers to further increase the breadth of this technique.

About the author

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