

Peanut-Shaped Nanostructures

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Tiny acorns that fuse together in pairs to form miniature peanuts – Japanese researchers have succeeded in producing peanut-shaped nanoparticles comprised of two different sulfur-containing substances. The ends of the “peanuts” are made of palladium sulfide and the center of cobalt sulfide, report scientists working with Toshiharu Teranishi in the journal *Angewandte Chemie*.

Unlike “normal-sized” granules, the structural characteristics – such as shape and size – of nanoscale inorganic particles have a significant effect on the physical and chemical properties of these tiny structures. Therefore, there is great interest in the discovery of processes for the controlled production of such particles.

Things get especially interesting when the nanoparticles are made of two different substances to give two different functionalities in one particle, such as luminescence and magnetism. Previous synthetic methods resulted in either a random, unordered mixture or defined core-shell structures in which one substance grows onto the surface of a particle of another.

However, a few years ago, a team led by Teranishi was able to synthesize particles with an unequal distribution of two substances, palladium sulfide and cobalt sulfide. In this process, the tiny granules of noncrystalline palladium sulfide, which measure only a few nanometers, act as crystallization nuclei for crystalline cobalt sulfide. Once a few tiny cobalt sulfide particles have settled onto the nucleus, this becomes the preferred site for further crystal growth, and the cobalt sulfide crystal

grows exclusively onto one side of the palladium sulfide granule. This results in acorn-shaped structures with palladium sulfide at one end and cobalt sulfide at the other.

The Japanese team has now gone a step further: under the right conditions, the tiny “acorns” can be induced to aggregate into pairs. The crystalline cobalt sulfide sides of the two acorns grow together into a continuous crystal lattice. This forms oblong particles with something of a “waist” – a shape reminiscent of a peanut.

Citation: Toshiharu Teranishi, Anisotropically Phase-Segregated Pd–Co–Pd Sulfide Nanoparticles Formed by Fusing Two Co–Pd Sulfide Nanoparticles, *Angewandte Chemie International Edition* 2007, 46, No. 10, 1713–1715, doi: 10.1002/anie.200603865

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