Nanoparticle scientist speaks on new discoveries at Goldschmidt Conference

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Scientists who work at the atomic and molecular levels - nanoscale - have to think big. After all, it is at this level where everything happens.

Alexandra Navrotsky, Distinguished Professor at the University of California, Davis, and Director of its Nanomaterials in the Environment, Agriculture, and Technology Organized Research Unit, has studied the properties of nanoparticles throughout her career. She presented her findings today in Knoxville, Tenn., at the Goldschmidt Conference, hosted by the University of Tennessee, Knoxville, and Oak Ridge National Laboratory.

"Nanoparticles are everywhere. You eat them, drink them, breathe them, pay to have them, and pay even more to get rid of them," Navrotsky said. Nanomaterials science deals with particles that are about one billionth of a meter long.

During the conference, Navrotsky spoke on recent discoveries she and Ph.D. student Chengcheng Ma made on the thermodynamic properties of transition metal oxides such as insulators and superconductors.

Navrotsky's research group found that the thermodynamic driving force -- the energy needed for oxidized reactions -- depends strongly on particle size. The ease with which these materials change their oxidation state is important in all kinds of applications, for example, the catalytic splitting of water for the production of hydrogen and oxygen, the metabolism of microorganisms and the evolution of mineral deposits.

Since chemical and biological reactions occur on the surface of a particle, these activities are enhanced at the nanoparticle scale. An understanding of the way nanoparticles react under certain temperatures and other conditions can be applied to many areas of science, including communication technology; agricultural technology; environmental remediation; interactions in the oceans, atmosphere, and biosphere; and biotechnology for medicine and health.

For example, the thermodynamics at the nanoscale in a battery affects its voltage output, so understanding this principle can help scientists make a more efficient battery.

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