Nanoparticle toxicity research

toxicity
APPLICATION NOTE

Nanoparticle toxicity

Nanotechnology has have a great impact in our society, improving our electronic devices, industrial processes, textiles, medical testing and dosing, among many other aspects of our lives. In order to continue enjoying the exponentially increasing benefits of nanotechnology, scientists need to research the risks involved when humans, animals, plants, and the environment are exposed to nanostructured materials. Such research, not only can identify those nanomaterials with high risk, but can also help the designing of new non-toxic materials without compromising their functionality.

Challenges

Unlike toxicity of bulk materials, toxicity of nanomaterials is both size and composition dependent. Understanding this dependency is at the core of the nanoparticle toxicity research. Common wet-chemistry methods need different complicated recipes to tune the particle size and composition, leaving biproducts in the solution and on the particles (e.g., surfactants). This way, testing for toxicity with wet-chemistry involves development of different synthesis and purification procedures. These two demanding steps can make the toxicity research inefficient. Therefore, there is a great need for innovative technologies that can directly produce pure nanoparticles with control over the size and composition to efficiently screen for the size and composition dependent toxicological properties of nanoparticles.

TECHNICAL INPUT

Particle Source	VSP-S1
Deposition Method	Diffusion
Deposition System	N/A
Deposition Parameters	N/A
Sample	Cell culture
Material	Transition metals
Application	Nanoparticle toxicity research
Analysis technique	TEM

Solution

The particle generator VSP-G1 efficiently produces pure nanoparticles with full control over their size and composition for toxicity testing. This particles can be delivered directly from the gas phase to cells for *in vitro* cytotoxicity studies, or can be put in a predefined solution for *in vivo* studies. An excellent VSPARTICLE tool for toxicological studies is the VSP-S1 (see set-up below), which allows to tune the size of the particle with a push of button. Moreover, since the VSP-S1 operates at ambient conditions, the target material can be rapidly exchanged to also efficiently screen composition dependent toxicological properties. The illustration below shows some important size and material dependent cytotoxicity properties (nanoparticle dissolution and transport through biological barriers) that can be efficiently studied with VSPARTICLE tools.

Example experiment setup

Size and composition-dependent cytotoxicity properties