

# Center for Applied Nanotechnology

## Material Science

### Thin Films and Composites

Thin Films and functional coatings encompasses the **modification of surfaces** on the nanometer scale. Nanoparticles used for such coatings include: semiconductors, metal and metal alloys as well as oxides.

Via a post-synthetic method the surface of single nanoparticles can be modified and adapted for different substrate materials. By changing their solubility – e.g. with hydrophilic or hydrophobic ligands on the particles' surface – the coating procedures and the film formation are controlled. Typical **film processing techniques** available within CAN GmbH are: dip-coating, spin-coating and spray-coating as well as the Langmuir-Blodgett technique.

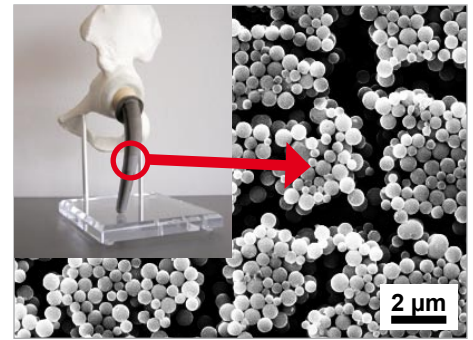
Being able to coat surfaces with nanoscaled layers which introduce a new functionality to a product is one important step. An additional feature is the durability of the coating. CAN GmbH is able to quantify thin film properties *via* **nanoindentation**. This method bears information concerning abrasion resistivity, delamination, Young's modulus and hardness of the applied film.

Combining **Composites/Specialty Polymers** with the thin film expertise, nanocomposites are developed. Nanoparticles used as additives find their application in improving e.g. mechanical and thermodynamical properties or introducing new properties to the material. Used particles include:  $\text{TiO}_2$ ,  $\text{ZnO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$  and others.

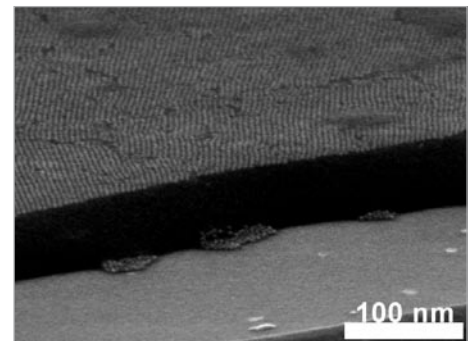
The research area in this field within CAN GmbH is based on **melt blending technologies** for compounding nanoparticles into polymer matrices which can be extruded or spun into fibers. To reduce costs CAN GmbH features lab scale equipment needing only some cubic centimeters of material.

CAN GmbH knowledge in the field of nanoparticle and polymer synthesis opens up large opportunities for **developing special nanoparticle – polymer based systems**.

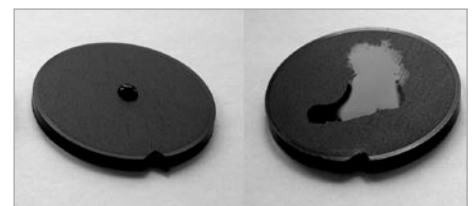
CAN GmbH offers companies and research institutions contract research and development services in the area of nanotechnology and participates in national and international research programs. The focus of activities is on the utilization of new findings made in chemical nanotechnology and analysis, particularly in the areas of consumables, special polymers and health care. The main areas of expertise include the production of numerous nanoparticulate materials, the encapsulation of active substances, the development of toxicity assays as well as the development of nanoparticle-based biological and medical markers.



The inset shows a hip implant coated with  $\text{TiO}_2$  nanoparticles, with an electron microscope close-up as background.



Spincoated monolayer of nanoparticles for use in LED and similar devices.



Uncoated, hydrophobic surface (left) and coated, hydrophilic polymeric surface (right).

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