



- 1 *Equipment for high-energy milling for the manufacturing of nanostructured composite powders*
- 2 *Melt spinning for the production of powders with nanocrystalline structures*
- 3 *Nanocrystalline Mg alloys, manufactured via melt spinning, for hydrogen storage*

## NANOSTRUCTURED MATERIALS

### Nanocrystalline materials

The potential of materials can be enhanced by reducing the grain size down to nanometer-size range. The properties of such materials are governed by the high grain boundary fraction of the matrix or the embedded nanoparticles. Regarding crystallite sizes  $\ll 1 \mu\text{m}$ , superplasticity is already expected at temperatures  $< 0,4 T_m$ . High-temperature stability and hardness of nanocomposites are further characteristic properties, which are interesting e.g. for light-metal alloys. In addition, functional properties can be improved systematically. Examples to be mentioned are hydrogen storage alloys or thermoelectric materials.

### Manufacturing

High-energy milling of elemental powder mixtures or pre-alloyed materials is an

attractive possibility for the generation of nanocomposites. Furthermore, rapid solidification methods (e.g. Melt Spinning) allow for the manufacturing of flakes or ribbons, which can be processed to powders with nanocrystalline structure.

Through the application of pressure-assisted consolidation techniques like hot pressing, hot isostatic pressing or spark plasma sintering, bulk materials with sub-micron or nanocrystalline microstructures can be prepared.

### Services

- Material development for specified component requirements, manufacturing of prototypes
- Analysis of thermal stability, structure and properties of consolidated nanocrystalline materials

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