

Foreign capital creating new nanotechnology innovations in Finland

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OM Group Inc.

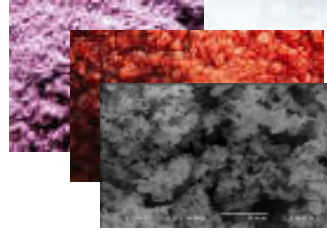


- **Company profile**
 - Diversified global producer of specialty chemicals & advanced materials
 - Headquartered in Cleveland OH, USA
 - About 2100 employees
- **Main businesses**
 - Global leader of cobalt products to the rechargeable battery, powdered metals and chemicals industries
 - Electronic chemicals, compugraphics and ultrapure chemicals to the memory disk, PCB and semiconductor industries
 - Advanced organic chemicals to the coatings, inks, polymer and petrochemical industries

OMG Kokkola Chemicals

- **Profile**

- #1 Cobalt producer in the world
- Operations in Kokkola, Finland
- About 380 employees
- Products: Cobalt chemicals & powders
- Side products: Germanium & Copper



- **Markets served**

- Rechargeable batteries (Li ion)
- Hard metals & diamond tools
- Chemical catalysts
- Ceramics & chemicals



Why nanotechnology ?

OMG's Technology platforms serving Li ion, powdered metals and chemical catalysts industries

Precipitation & Crystallization

Production of metal salts

- Controlled purity
- Specific morphology
- Controlled crystallinity

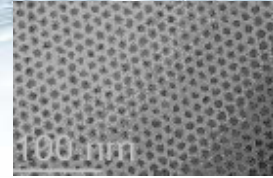
Hydrothermal & Reduction Tech

Production of metal powders & oxides

- Autoclave technology
- Hydrogen reduction
- Controlled oxidation

- Key performance of our standard products based on particle size distribution with the range of 500 nm – 100 microns
- Our markets require increased performance

OMG Nanotechnology platforms



H₂ reduction of metal chlorides VTT

Cobalt & Nickel nanoparticles

- 10-100 nm particle size
- Very narrow size distribution
- Good oxidation resistance

Carbonyl decomposition HUT

Cobalt & Iron nanoparticles

- 5-150 nm particle size
- Easy control of PSD
- In situ coating of particles

Quantum Sphere USA

Co, Ni, Fe, Cu, Mn, Cr, In, Ga, Ag

- 8-75 nm particle size
- Gas-phase condensation technology
- Exploring markets for large companies & applications

Why to invest in Finland in nanotech R&D ?

- **1. Finnish Innovation Environment**
 - Well-working network between universities, research institutes and industrial companies
- **2. Intellectual Property**
 - IP rights belong to the commissioner in contract research
 - Enables open information exchange between academia and industry
- **3. TEKES Support**
 - Decrease costs of high-risk R&D for companies
 - Supports consortia for applied research

Bottlenecks in nanotech commercialization

- **1. Volumes**
 - Volumes are still small for nanoparticles
 - Large companies can not invest in scaling up processes
- **2. Application know-how**
 - Very limited application development in Finland
 - Commercialization process needs to be targeted to global markets from the first stage
- **3. Environmental, Health & Safety issues**
 - Lack of information about EHS effects of nanoparticles
 - Large companies hinders commercialization in order to minimize risks