Metal Nanoparticles for the European industry

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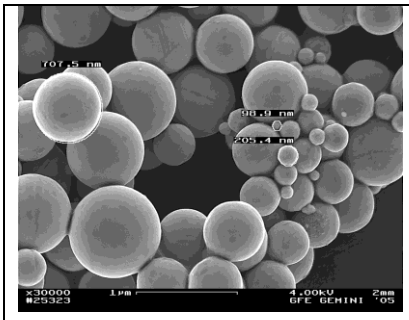
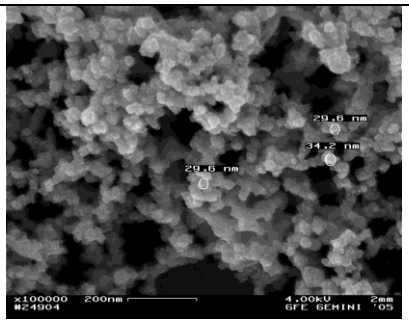
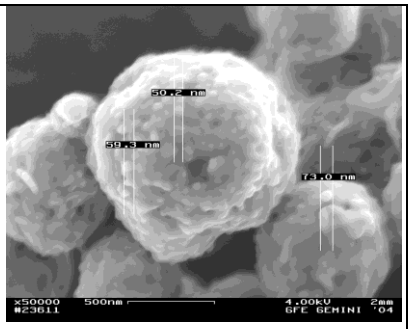
Metal catalysts e.g. Me (Ag, Cu, Co) / ZnO/ Al_2O_3 are industrially employed for methanol synthesis and the water gas shift reaction, and are also known to be active for the steam reforming of methanol. Methanol is an alternative hydrogen source for fuel cell application. The strong increase in catalytic activity is a consequence of the resulting higher metal surface area if nanoparticles are used.

Spherical, non-agglomerated nanosized particles of metals (Ag, Cu, Co) were prepared by ultrasonic dispersion (USP) of solutions of $AgNO_3$, $CuSO_4$, $Co(NO_3)_2$ forming aerosols with constant droplet sizes in hydrogen and nitrogen atmosphere. The concept or the basis of spray pyrolysis method assumes that one droplet forms one product particle. A controlled particle size was realized through the choice of solution concentration as well as by changing the aerosol decomposition parameters. The thermal decomposition was realized inline using a tube furnace working at temperatures close to the individual metal melting points. Some examples of obtained of Ag-, Cu- and Co-particles are shown below. The mean particle sizie can be adjusted between 50 and 500 nm by variation of the process parameter set.

		
Silver powder obtained from $AgNO_3$ [1]	Copper powder obtained from $CuSO_4$ [2]	Cobalt powder obtained from $Co(NO_3)_2$ [3]

Nanoparticles e.g. of silver may be also used to protect bacterial influence. Nanosized particles have reduced melting and sintering temperatures compared to micron-sized particles and open new applications and processing alternatives. When nanosized silver conductor materials could be processed at temperatures at low at 100°C. Nanosized particles of copper could be used as an additive in lubricants for the minimization of an attrition. In the future more applications of metal nanoparticles is expected also in environmental protection.

[1] Stopić, S, Dvorak, P, Friedrich, B., Metall **2006**, 60, 6, 299. [2] Stopić, S, Dvorak, P, Friedrich, B., World of Metallurgy Erzmetall **2005**, 58, 4, 191. [3] Gürmen, S, Stopić, S., Friedrich, B., Materials Research Bulletin, **2006**, accepted for publication