66d Ultrafine Particles for Catalytic Applications Made by Spray-Pyrolysis

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The synthesis of catalytic particles produced by spray pyrolysis routes is described here. Spray pyrolysis involves the atomization of a precursor solution into a reaction zone. The catalytic particles were produced by thermally decomposing the respective metal precursors (nitrates and oxalates). These precursors were atomized into a fine mist and the resulting chemical aerosol feed was introduced into the reactor using a carrier gas. Inside this reaction zone the precursor(s) decomposes to the corresponding metal oxide(s). Parameters that were studied include reactor temperature, precursor concentration and precursor type. The spray pyrolysis process enables one-step production of catalyst particles where the nanometer sized active phases (Pt, PtRu, metal alloys, metal oxides, composite and anchored molecular compounds) are highly dispersed on the surface of supports. The aerosol processes described here also enable production of metal oxide and mixed metal oxide supports with improved temperature stability. In one example, the synthesis of high temperature shift reaction catalysts will be discussed. The catalysts produced by spray pyrolysis were physically and chemically characterized and tested in standard catalytic reactions. The physical properties and catalytic activity of the particles produced under different reactor conditions will be compared. Additional examples of catalytic particles that will be presented include cerium oxide particles for automotive catalyst applications. Finally, the capability of spray pyrolysis route to produce in a single step supported catalysts for hydrotreatment of liquid fuels will be presented.