

66b Co-Synthesis of H₂ and ZnO Nanoparticles by in-Situ Zn Aerosol Formation and Hydrolysis

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Simultaneous production of H₂ gas and ZnO nanoparticles by hydrolysis of freshly formed Zn nanoparticles in a hot wall aerosol flow reactor is investigated. Superheated Zn metal vapor was carried by Ar gas flow (1-2 l/min) into a quartz tube reactor where it was mixed with equimolar Ar-H₂O superheated vapor forming Zn/ZnO nanoparticles and H₂. The influence of reactor temperature (623 K < T < 1023 K), on H₂ conversion and product particle yield and characteristics was studied. Hydrogen production was monitored online by a gas chromatograph and the product particles were characterized by nitrogen adsorption, x-ray diffraction and transmission electron microscopy. A maximum H₂ conversion of 81 % with respect to Zn metal, a maximum product particle yield of 27 % containing up to 88 wt% ZnO, with Zn and ZnO crystallite sizes in the order of 100 and 40 nm, respectively, were achieved.