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Characterization of Nanometer- to Micron-Sized Aluminum Powders by Thermogravimetric Analysis

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Abstract: The reactivity of **aluminum** powders was studied by thermogravimetric analysis in air, oxygen, and nitrogen. Weight gains from complete oxidation of the **aluminum** were used to calculate particle sizes in the range of 30 nm to 500 nm. These particle sizes correlated well with particle sizes derived from surface area measurement. Particle size was also examined by scanning electron microscopy and atomic force microscopy, and compared to crystallite size determined by x-ray diffraction. Weight gains from complete oxidation were also used to determine the amount of active metal and **aluminum oxide** present in the submicron powders. Nitridation of **aluminum** powders was studied for extended times at 600 deg C. A 2 micrometer powder was nearly completely nitrided in 1 h, indicating that the nitride product has little inhibiting effect on the reaction.

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