

Air-Stabilized aluminum nanoparticles from sonochemical thermal decomposition of alane

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The synthesis of aluminum nanoparticles using sonochemistry was investigated systematically by using alane as precursors and molecules with one or a pair of carboxylic acid groups as surface passivation agents. Alane had ability to synthesize well-defined and dispersed aluminum nanoparticles from titanium-catalyzed decomposition. The results demonstrated that the passivation agent played dual roles of trapping aluminum particles to keep them nanoscale during the decomposition of alane and protecting the aluminum nanoparticles postproduction from surface oxidation. Characterization data indicated the presence of spherical aluminum nanoparticles with average 100 nm or less in diameter that are capped with an organic shell. By modifying organic molecules and the rate of alane decomposition was critical to the desired aluminum nanoparticles. Some fundamental and technical issues on the alane decomposition and the protection of the resulting aluminum nanoparticles are discussed.