Advanced Surface Engineering Division
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Advanced Surface Engineering Poster Session

SE-ThP1 Surface Passivation of Energetic Particles Via Atomic Layer Deposition, ***Kai Qu***, Huazhong University of Science an Technology, PR China, *C.L. Duan*, *P.H. Zhu*, *J.M. Cai*, *R. Chen*, Huazhong University of Science and Technology, PR China

Energetic particles, such as aluminum hydride (AlH_3) and aluminum (Al) nanoparticles, have shown great potentials for military and astronautic uses. Due to their high reactivity, the practical implementations of these materials rely on their safe storage, handling, transportation, etc. For example, during the storage of AlH_3, hydrogen could be slowly released through reaction with moisture and oxygen. When mixing AlH_3 with other fuels or transportation, the heat generated from inter-particle friction may lead to the temperature rise, resulting in rapid hydrogen release and may trigger explosion. When fabricate explosive in water at 60-70℃, aluminum nanoparticles will react with water molecules. Thus it is imperative to passivate the AlH_3 and Al particles to improve their stabilities. In this talk, both α-AlH_3 and Al particles were passivated *via* atomic layer deposition to improve their storage, transportation, and mixture stabilities. The transmission electron microscopy showed conformal amorphous Al_2O_3 shells around the crystalline AlH_3 cores. The hydrogen capacity was well retained after hydrothermal aging test. The friction sensitivity got reduced, while the overall hydrogen capacity and dehydrogenation speed are kept about the same. For Al nanoparticles, a few cycles of compact ALD coating could completely isolated the water bath at 60℃-80℃. The minimum thickness of coating layers ensured that high energy of the Al nanoparticles were well retained.

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