Studies on synthesis of lithium-based core-shell nanoparticles by supersonic thermal plasma expansion method for energy storage applications.

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Abstract

With the growing interest for new and better rechargeable batteries for uses related to the increase demand in electromobility and increasingly sophisticated portable devices, it is necessary to develop new technologies to increase the energy density available in the new generations of energy storage devices. Li-S-C nanoparticles have shown a great capacity to store energy, which presents an interesting opportunity to develop this type of nanoparticles in a country like Chile, which has large reserves of this element. On the other hand, there has been a growing interest in the synthesis of nanoparticles using thermal plasma techniques. The availability of extremely high temperatures, high enthalpies, compact reactor size, high yields, non-equilibrium phases, extremely fine crystallinity, and a rapid one-step synthesis process are some of the advantages of this method.

The general objective of the investigation is the synthesis of lithium sulfide nanoparticles and mixture/encapsulation with carbon by the supersonic thermal plasma expansion method, for energy storage applications. Taking this into account, the studies mainly focus on the synthesis of carbon encapsulated core-shell nanoparticles (less than 100 nm) using supersonic thermal plasma expansion technique. In this presentation, we will present the synthesis technique, optimizations and the results including the effects of the different operational parameters on the characteristics of the produced nanoparticles will be discussed. Figure 1 shows some comparative images of the produced nanoparticles.

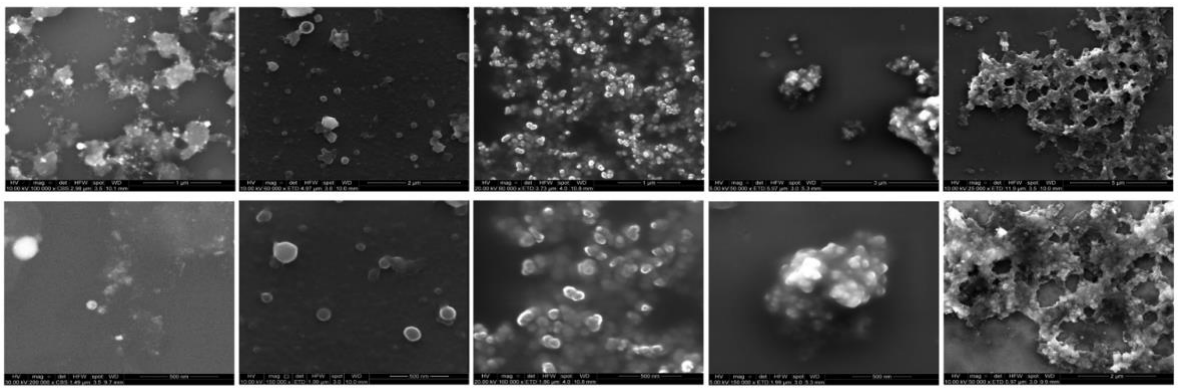

Figure 1. Comparative images of the produced nanoparticles

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