Development of a nanostructured lithium-ion 3D battery

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The world's energy consumption is in constant growth. Since petroleum, natural gas and coal are non-renewable energy sources, there's a growing interest for technologies that are able to stock transient green energy like wind and solar. Lithium-ion batteries have all the necessary characteristics to be one of these technologies. However, for the plug-in hybrid car industry, the lithium-ion battery charge speed required for energy recovery during breaking is insufficient. The diffusion of lithium ions between two electrodes is usually the limiting step. Therfore, reducing the transport distance can improve its transport speed. In this project, a porous carbon anode that is nanostructured and ordered tridimensionally is fabricated. The carbon anode was then covered with a nanometer thick polymer that has two functions. The polymer acts as an electrical insulator to avoid short-circuits and as a solid electrolyte to allow transport of lithium ions between the electrodes. The last step is to fill up the insulated nanostructured anode with a material that will be used as the cathode in the 3D battery.

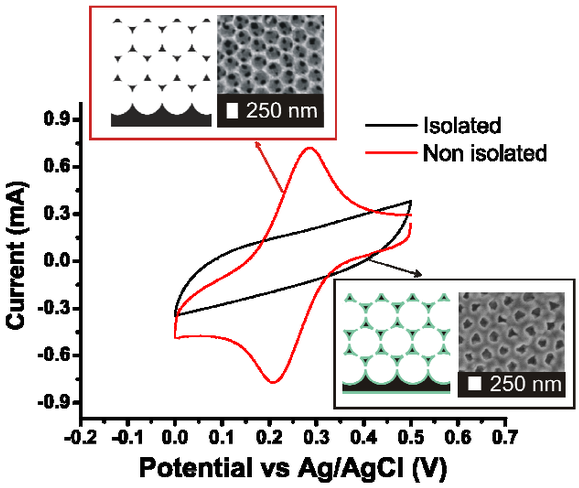

Figure 1: Schematics, SEM images and cyclic voltammetry of the non isolated and isolated carbon anode.