Antimony (Sb) based Pseudo 2D(δ+) Hybrid Nanomaterials for Energy Storage Applications

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Abstract: Energy has become the topic of conversation throughout the world. The daily rise in energy conjunction motivated researchers to find innovative ways to produce and storing the energy. Battery is one of such technologies that offer sustainable and reliable supply chain based on the renewable. Due to its distinctive puckery layered structure, Antimony (Sb) exhibits excellent conductivity and reactivity with not just lithium ions but also sodium ions and it can provide higher theoretical capacity. Herein, we have demonstrated the Sb, puckery layered material's electrochemical performance and have hybridized with the low dimension nano materials (Sb-Graphene, MWNT, SWNT). To understand the mechanism for achieving higher capacity and other electrochemical properties also the role of dangling bonds in the enhancement of ionic conductivity. We compared the material in the bulk as well as in low dimension as an inter-metallic state. A possible mechanism (π-π interaction) has also been proposed which falls well with the simulation studies published in the literature. However, the search for new materials and their hybrids cannot be ignored as graphite's interaction with electrolytes leads to poor performance on prolonged usage. Low dimension carbon nano materials like, Graphene, MWNTs (Multi Wall Nano Tubes), SWNT (Single Wall Nano Tubes) exhibit exceptional electrical conductivity, a large surface area, and mechanical strength, contributing to an enhanced lithium storage capacity and rate capability, ultimately leading to improved battery performance. Low dimension materials, Due to the numerous amazing properties it possesses, a sheet of carbon atoms bonded together in a honeycomb lattice arrangement, is widely regarded as a "wonder material. To make sure the Sb based hybrid nanomaterials have been synthesized in the right phase and purity, we have also examined the material using a variety of characterization techniques.