Triangle-Shaped Graphene Domains by LP-CVD and Update of Graphene Application in Motive Power Battery

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Abstract

The initial nucleation and growth dynamics of graphene play a critical role in determining the final quality of CVD graphene films, and it is highly desirable to synthesize large area high quality single crystalline graphene films [1, 2]. The shape and structure of individual graphene domains greatly influences its property and directly determines the grain boundary in polycrystalline graphene films. Thus, the tailoring and direct observation of the domain shape structure are very important for understanding the growth mechanism as well as to maximize single-crystalline graphene's inherent outstanding properties for future applications. I will report the growth of large-scale "triangle" graphene domains on Cu foils during the early stage of CVD operated under low pressure. This work represents an important step toward realization of fabrication of larger area graphene sheets with controllable shape and alignment.

With the development of scientific and technological innovation over the past decades, graphene based products is growing rapidly around the world. Today lead-acid batteries are the most widely used rechargeable systems and still share about 65% of the rechargeable batteries market. Although lead-acid systems were investigated and developed over 150 years, research continues to enhance their performance in terms of rate capability, stability, cycle life and durability [3]. Graphene is envisaged to enhance the performance of these batteries as the most efficient materials in terms of high intrinsic electrical conductivity, extremely lightweight, chemical inert, and flexible with a large surface area. The presence of graphene in the electrodes improves the electrical conductivity between the active mass particles through preventing thickening and the growth of large $PbSO_4$ particles [4]. This improvement is naturally attributed to the formation of a stable conductive active mass matrix that enables the delivery and distribution of current to all the active material homogeneously. By enabling a uniform current distribution, and subsequently well distributed electrochemical redox reactions throughout the electrode matrix, arrested the formation of too large $PbSO_4$ particles. The addition of graphene is supposed to improve both the mechanical stability and electrical integrity of the electrodes and to induce uniform changes in the active mass during the complicated conversion reactions during cycling. As the largest producer of motive power battery in the world, Chaowei has a potential need of graphene with 1000 tons/year. In this talk, I will present latest research of graphene commercially application in motive power battery, especially E-bike market.

References

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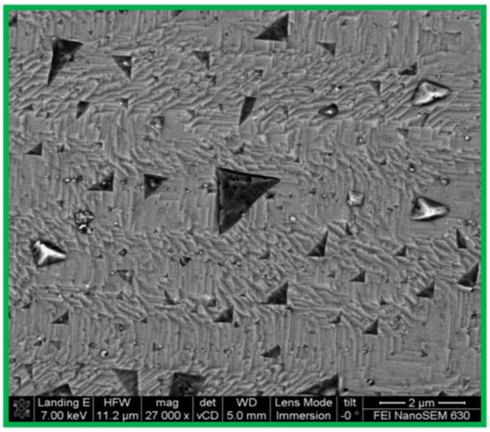
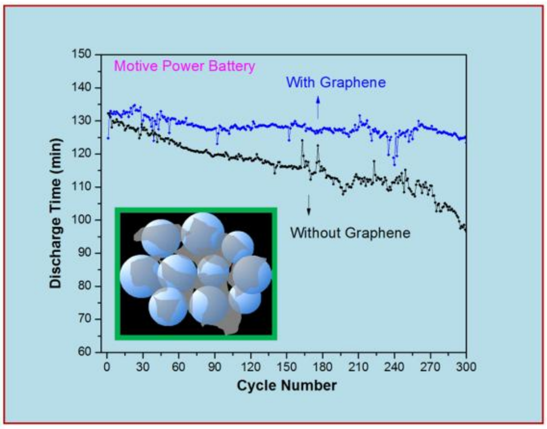
Figures





Typical SEM image of "triangle" graphene domains (Left) and cycle life of battery (Right).