전계 펄스 인가 증발 방법을 이용한 그라핀의 특성 연구

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Characteristics of graphene sheets synthesized by the Thermo-electrical Pulse Induced Evaporation

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Abstract : Carbon-based nano materials have a significant effect on various fields such as physics, chemistry and material science. Therefore carbon nano materials have been investigated by many scientists and engineers. Especially, since graphene, 2-dimemsonal carbon nanostructure, was experimentally discovered graphene has been tremendously attracted by both theoretical and experimental groups due to their extraordinary electrical, chemical and mechanical properties. Electrical conductivity of graphene is about ten times to that of silicon-based material and independent of temperature. At the same time silicon-based semiconductors encountered to limitation in size reduction, graphene is a strong candidate substituting for silicon-based semiconductor. But there are many limitations on fabricating large-scale graphene sheets (GS) without any defect and controlling chirality of edges. Many scientists applied micromechanical cleavage method from graphite and a SiC decomposition method to the fabrication of GS. However these methods are on the basic stage and have many drawbacks. Thereupon, our group fabricated GS through Thermo-electrical Pulse Induced Evaporation (TPIE) motivated by arc-discharge and field ion microscopy. This method is based on interaction of electrical pulse evaporation and thermal evaporation and is useful to produce not only graphene but also various carbon-based nanostructures with feeble pulse and at low temperature. On fabricating GS procedure, we could recognize distinguishable conditions (electrical pulse, temperature, etc.) to form a variety of carbon nanostructures. In this presentation, we will show the structural properties of GS by synthesized TPIE. Transmission Electron Microscopy (TEM) and Optical Microscopy (OM) observations were performed to view structural characteristics such as crystallinity. Moreover, we confirmed number of layers of GS by Atomic Force Microscopy (AFM) and Raman spectroscopy. Also, we used a probe station, in order to measure the electrical properties such as sheet resistance, resistivity, mobility of GS. We believe our method (TPIE) is a powerful bottom-up approach to synthesize and modify carbon-based nanostructures.

Key Words : graphene, carbon-based nanostructures, TPIE