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전해증착법을 이용한 결정성 ZnTe 나노와이어 성장 및 특성평가

김동욱, Shanmugam Rajakumar, 박기문, 유봉영†

한양대학교 재료공학과
(byyoo@hanyang.ac.kr†)

본 연구에서는 전해증착법을 이용하여 결정성 ZnTe 나노와이어를 성장시켰고, 구조적 및 전기적 특성을 평가하였다. 또한 나노와이어 성장에 앞서, 결정성 ZnTe 박막을 전해증착법으로 형성하였고, 그 박막의 특성을 관찰하였다. 화학양론적(stoichiometric) 조성을 가지는 박막을 성장시키기 위하여, 순환전류전압법(cyclicvoltammetry)을 이용하여 Zn, Te, 이온들과 구연산 착화체(citrate-complexes)로 구성된 수용액 전해질에서 각 원소의 환원전위 분석이 이루어졌고, 과전압(overpotential)과 전해질 온도와 농도등과 같은 전해증착 조건에 따라 박막을 증착하였다. 각 조건에서 전해증착된 박막은 주사전자현미경(SEM)과 EDS를 이용하여 표면과 두께 그리고 성분분석을 하였고, XRD 분석법을 이용하여 박막의 결정성 변화를 관찰하였다. 박막증착 실험에서의 알맞은 증착조건을 나노와이어 전해증착실험에 적용하여, 다공성의 양극산화알루미늄(Anodic Aluminium Oxide, AAO) 템플레이트를 이용하여 bottom-up 방식으로 결정성 ZnTe 나노와이어를 성장시켰다. 수산화 나트륨(NaOH)용액을 이용하여 템플레이트를 선택적으로 에칭하여 제거한 후, ZnTe 나노와이어의 구조적 및 전기적 특성을 분석하였다.

Keywords: 전해증착법, ZnTe, 결정성, 나노와이어, 박막

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Direct Printing and Patterning of Highly Uniform Graphene Nanosheets for Applications in Flexible Electronics

구자훈, 이태윤[1],†

연세대학교 전기전자공학부 나노바이오 소자 연구실, [1]연세대학교 전기전자공학부
(taeyoon.lee@yonsei.ac.kr†)

With the steady increase in the demand for flexible devices, mainly in display panels, researchers have focused on finding a novel material that have excellent electrical properties even when it is bended or stretched, along with superior mechanical and thermal properties. Graphene, a single-layered two-dimensional carbon lattice, has recently attracted tremendous research interest in this respect. However, the limitations in the growing method of graphene, mainly chemical vapor deposition on transition metal catalysts, has posed severe problems in terms of device integration, due to the laborious transfer process that may damage and contaminate the graphene layer. In addition, to lower the overall cost, a fabrication technique that supports low temperature and low vacuum is required, which is the main reason why solution-based process for graphene layer deposition has become the hot issue. Nonetheless, a direct deposition method of large area, few-layered, and uniform graphene layers has not been reported yet, along with a convenient method of patterning them. Here, we report an evaporation-induced technique for directly depositing few layers of graphene nanosheets with excellent uniformity and thickness controllability on any substrate. The printed graphene nanosheets can be patterned into desired shapes and structures, which can be directly applicable as flexible and transparent electrode. To illustrate such potential, the transport properties and resistivity of the deposited graphene layers have been investigated according to their thickness. The induced internal flow of the graphene solution during tis evaporation allows uniform deposition with which its thickness, and thus resistivity can be tuned by controlling the composition ratio of the solute and solvent.

Keywords: Graphene, Flexible electronics, Transparent electrode