세미나 요약 (Abstract)

강연제목 (Title)	Solution phase synthesis of Heterostructured TMDs: Advantages and Prospects		
강연자 (Speaker Name)	이 승 기	일시 (Date)	2021.05.07. 13:00~14:00

2D metal chalcogenide thin films have recently attracted considerable attention owing to their unique physicochemical properties and great potential in a variety of applications. Synthesis of large-area 2D metal chalcogenide thin films in controllable ways remains a key challenge in this research field. Recently, the solution-based synthesis of 2D metal chalcogenide thin films has emerged as an alternative approach to vacuum-based synthesis because it is relatively simple and easy to scale up for high-throughput production. In addition, solution-based thin films open new opportunities that cannot be achieved from vacuum-based thin films.

In this talk, structure controllable synthesis of TMDs (e.g., MoS_2, WS_2) is suggested by facile solution-based direct photothermal method in ambient conditions. The precursor layer of each TMD, which has at least 3 orders of magnitude higher absorption coefficient than those of neighboring layers, rigorously absorbed the incoming energy of the laser pulse and rapidly pyrolyzed in a few nanoseconds, enabling the generation of a MoS_2 or WS_2 layer without damaging the adjacent layers of SiO_2 or polymer substrate. Through experimental and theoretical studies, we establish the underlying principles of selective synthesis and optimize the laser annealing conditions, such as laser wavelength, output power, and scribing speed, under ambient condition. As a proof of concept, we demonstrated the behavior of a MoS_2-based field-effect transistor, a skin-attachable motion sensor, and a MoS_2/WS_2-based heterojunction diode in this study. The ultrafast and selective synthesis of the TMDs suggests an approach to the large-area/mass production of functional heterostructure-based electronics.