

Black Phosphorous 잉크 제조 및
잉크젯 프린팅을 이용한 박막 증착 공정 개발

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Black phosphorus (BP), the most stable allotrope of phosphorus, is a material stacking individual atomic layers together through van der Waals interactions. The band gap of BP is tunable from 0.3eV for bulk BP to 2.0eV for phosphorene (monolayer BP) depending on the number of stacked layers. Two-dimensional black phosphorus (phosphorene) dispersed in a solution is obtained by the solvent exfoliation. Among various solvents, N-methylpyrrolidone (NMP) is found to provide stable, highly concentrated BP dispersions. However, its instability under ambient conditions limits material deposition options for device fabrication. Black phosphorous thin films were deposited on the substrates using ink-jet printing method. Physical properties of the films were systematically characterized by AFM, PL, TEM and Raman spectroscopy. In this study, the stable, highly concentrated, electronic-grade phosphorous thin films were successfully deposited by combining the solvent exfoliation with the ink-jet printing deposition method. Considering our result obtained in this study, it is believed that the black phosphorene prepared in this study could be applied to large-area, high-performance phosphorene devices.