

Thickness Control of Black Phosphorus Using UV/Ozone Treatment

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Black phosphorus (BP) has been recently rediscovered as a promising 2D material, owing to its direct band gap, high carrier mobility and large on/off ratio. As the properties, including bandgap, of BP depend on the thickness, preparing BP film with desired thickness is an issue. In this study, UV/Ozone treatment is introduced to reduce the thickness of BP. UV irradiation causes ozone radicals, which attack phosphorus atoms to form P_xO_y species. These P_xO_y compounds are then converted into phosphoric acid as they react with water molecules. Optical microscope and scanning electron microscope were used to observe the thinning process of BP flakes. In addition, Raman spectroscopy integrated with UV lamp was employed in order to analyze in situ optical characteristics of BP. Performing in situ experiment is effective in obtaining accurate results as BP has anisotropic properties that change depending on the position of the sample. We assume this technique can be easily applied in fabricating different BP-based devices. Further results and discussion will be presented in detail.