

CHEMICAL VAPOR TRANSPORT ROUTE TOWARD BLACK PHOSPHORUS NANOBELTS AND NANORIBBONS

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Chemical Vapor Transport method is widely used for bulk black phosphorus (BP) fabrication. We present a new approach for the fabrication of black phosphorus nanoribbons, which consists of a two-step procedure, including black phosphorus column growth using the chemical vapor transport technique, followed by ultrasonic treatment and centrifugation. The obtained nanoribbons preserve BP column dimensions, forming ultra-long nanoribbon structures with the length/width aspect ratio of up to 500. Recent theoretical studies predict that black phosphorus nanoribbons could surpass optical and mechanical properties of phosphorene. Additionally, properties such as carrier mobility and electronic structure can be controlled by changing the nanoribbons dimensions creating a spectrum of possible applications. These range from electronic¹, spintronic² and optoelectronic³ devices, to sensors⁴ and batteries⁵.

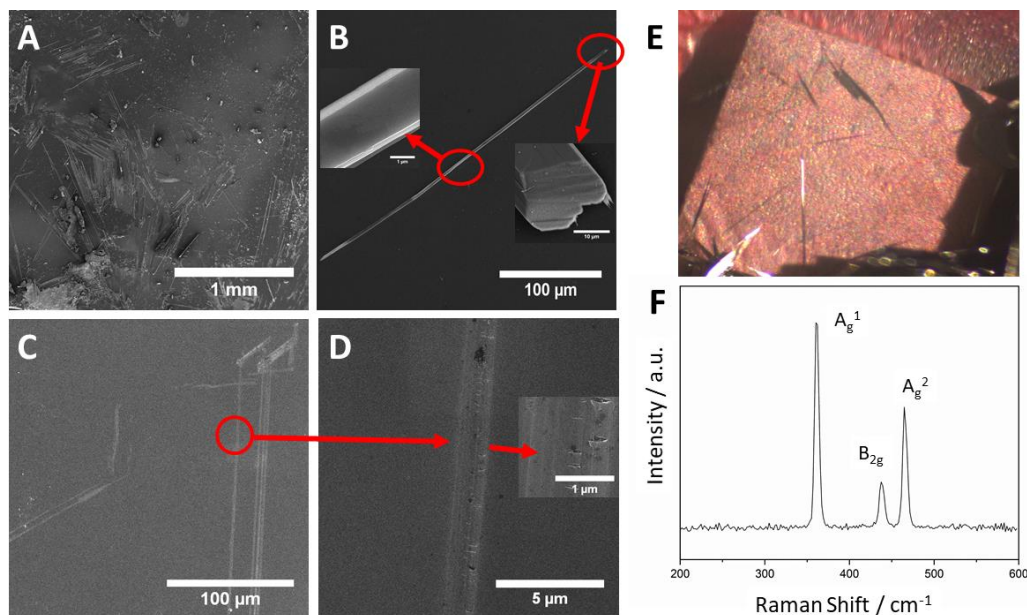


Fig 1. SEM images of (A,B) BP column and (C,D) BP nanoribbons. E) optical microscope image of BP columns formed on substrate surface and F) Raman spectra collected from a single column

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