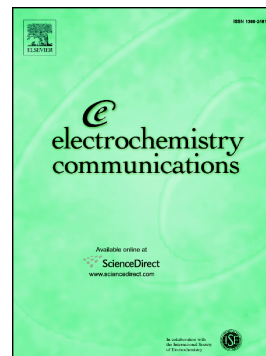


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# Electrochemical cathode exfoliation of bulky black phosphorus into few-layer phosphorene nanosheets

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## ABSTRACT

Black phosphorus (BP) has gained great interest due to its tunable band-gap structure which strongly depends on the number of layers. The key step therefore towards application of BP is the preparation of few-layer or multilayer BP materials. However, because of the high chemical reactivity of BP, the preparation process must be handled with special care to avoid oxidation-induced degradation. Here we introduced a facile and scalable electrochemical method to generate BP nanosheets where BP served as the cathode. Subsequently, the product was characterized by TEM, Raman, UV-Vis, AFM, XPS and FTIR techniques. The relevant characterization data indicated that the thickness of the obtained BP nanosheets was mainly in the range of 2–7 nm. Furthermore, oxidation can be completely avoided during this electrochemical cathode exfoliation process, which provided high-quality BP nanosheets.

Keywords: Electrochemical exfoliation, Black phosphorus, Phosphorene

## 1. Introduction

The exceptional properties of graphene over its bulk counterparts have stimulated significant efforts to explore other new fascinating two-dimensional (2D) materials

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