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Exfoliation, oxidation and functionalization of antimonene

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In recent years two dimensional (2D) materials like graphene, transition metal dichalcogenides, and more recently black phosphorus are receiving increasing attention.[1] One of the most promising 2D materials is antimonene, due to its strong spin-orbit coupling (SOC), with a drastic evolution from an indirect gap semiconductor (monolayer), through a possible 2D topological insulator (3-4 layers) to a 3D topological semimetal (> 7 layers).[2] However, the synthesis, characterization and chemistry of antimonene remain almost unexplored. Herein, we report a detailed study of the exfoliation, oxidation and functionalization of thin layer antimonene. The aim of this work was to find the best conditions for the exfoliation of antimonene thin flakes. Therefore, different solvents and different sonication times were used. In addition the oxidation behavior was analyzed. Different causes might be heat, sonication and laser induced oxidation. For the latter, different laser wavelength with different intensities were used. Furthermore a first possible pathway for the covalent functionalization of antimony was performed. The samples were analyzed, among others, with atomic force microscopy, statistical Raman spectroscopy and thermogravimetric analysis coupled with mass spectroscopy. This work provides insights into the understanding of the exfoliation, oxidation and functionalization of antimony and will serve as a guide for further applications in fields of utmost importance like energy storage and catalysis.

References

[1] Authors, Journal, Issue (Year) page (Calibri 11) Indicate references with sequential numbers within [square brackets].

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