**Facile production of hexagonal boron nitride nanoparticles by cryogenic exfoliation**

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1. **Introduction**

Fluorescent nanoparticles with optically robust luminescence are imperative to applications in imaging and labelling. Here we demonstrate that hexagonal boron nitride (hBN) nanoparticles can be reliably produced using a scalable cryogenic exfoliation technique, with sizes below 10 nm. The particles exhibit bright fluorescence generated by color centers that act as atomic-size quantum emitters.

1. **Method**

The original hBN powder was purchased commercially from Graphene Supermarket Inc. with a mean particle size of ~100 nm. To fabricate smaller nanoparticles, we adopted a recently-developed cryogenic exfoliation technique23. We then performed optical characterizations of the obtained nanoparticles.

1. **Results and Discussions**

We analyze their optical properties, including emission wavelength, photon-statistics and photodynamics, and show that they are suitable for far-field super-resolution fluorescence nanoscopy. The emitter photodynamics were analysed by SMLM, which demonstrates their potential use as fluorescent markers for bio-imaging applications.

1. **Conclusions**

The facile nanoparticle production method, together with their favorable optical properties and the established biocompatibility of hBN make this system a promising platform for super-resolution imaging and quantum sensing applications.

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