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Size, shape and colloidal stability of fluorescent nanodiamonds in aqueous suspension

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Fluorescent nanodiamonds (FNDs) containing negatively charged nitrogen-vacancy (NV–) centres have outstanding optical, photostability and spin properties which make them promising candidates as nanoscale sensors, and for quantum computing and bioimaging in biological media.

The location of NV atoms relative to the surface of the particles is essential for these applications – if the NV atoms are buried too deeply, this will lead to lower brightness3. To optimize these properties, the particles must either be small or must have at least one dimension which is thin (eg plate shaped particles). The size and shape are therefore vital parameters to be investigated. Our collaborators4 examined the size effect on the optical properties of a wide range of FND particles, however, their 3D structure and colloidal stability have not been widely studied and are not well understood.

Here, we systematically investigate the 3D shape of FNDs in water for a range of sizes and investigate the colloidal stability of these particles using dynamic light scattering, depolarised dynamic light scattering and synchrotron-based small-angle X-ray scattering (SAXS). Initial (SAXS) results suggest an interesting relation between the reported shape, DLS size of FND particles and emitted fluorescence.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Synchrotron

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

Yes

Condition of submission

Yes

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