

Title: Formation of Nitrogen-Vacancy centers in nanodiamonds:**Dependence on Size and Origin**

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Negatively-charged nitrogen-vacancy (NV⁻) defects in nanodiamonds are a promising nano-scale probe for quantum sensing with excellent bio-compatibility. To maximize the potential of this versatile tool, the smallest type of nanodiamonds that carries NV⁻ defects are highly desirable and are available in the form of 5-nanometer detonation nanodiamonds (DNDs). Previously, we discovered that the common NV⁻ formation mechanism may not be applied to DNDs.^[1] To investigate the reasons behind this phenomenon, the NV⁻ formation process is studied experimentally in a series of nanodiamonds with different sizes and origin (DNDs, nanonized high-pressure-high-temperature diamonds), and additional simulations complete the mechanistic understanding.

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[1] D. Terada, T. F. Segawa, A. I. Shames, S. Onoda, T. Ohshima, E. Ōsawa, R. Igarashi, M. Shirakawa, ACS Nano 13, 6461 (2019).