



Contribution ID: 95

Type: Poster

Correlation spectroscopy for nanoscale NMR with nitrogen-vacancy centers

Nanoscale NMR is a technique that enables the study of the structure and properties of materials at the nanoscale level. In this regime, NV centers can be utilized as highly sensitive magnetic sensors to detect the magnetic fields produced by nearby nuclei. By placing a target sample close enough to the NV ensemble (i.e. at tens of nanometers), standard thermal polarization is replaced by statistical polarization as the dominant source of the interaction mechanism between target and sensor, making it impossible to use standard NMR techniques for scanning. To address this, we designed correlation spectroscopy methods for nanoscale NMR. Furthermore, we study the effect of including an RF pulse to manipulate the sample's nucleus. Overall, this study offers insights into the potential of nanoscale NMR for future research in material science.

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