

# Rare earth ions in molecular crystals for quantum information application

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Rare-earth ions in solid state hosts are promising candidates for optically addressable spin qubits, owing to their long optical and spin coherence times in the solid state [1]. Recently, rare earth ions in organic molecules have demonstrated outstanding coherence properties, while also promising a large parameter space for optimization by chemically engineering of the host molecule [2-4]. We characterize the optical properties of novel rare earth ion based molecular crystals at low temperature using techniques such as photoluminescence excitation spectroscopy, absorption spectroscopy and spectral hole burning. We observe narrow homogenous and inhomogeneous linewidths and long-lived spin polarization, confirming the great potential of molecular rare earth materials for quantum information applications.

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## References

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- [4] Mor, Ori Ezra, et al. "Tapered Optical Fibers Coated with Rare-Earth Complexes for Quantum Applications." *ACS photonics* 9.8 (2022): 2676-2682.

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## Figures

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**Figure 1:** Millimeter size rare earth ion molecular crystal

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