

Rare-earth ions in nanocavities as a quantum information platform

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Rare-earth ions doped in solids have unique, appealing properties of long optical and spin coherence time. These properties make them excellent candidates for quantum information processing. Its ability has been shown in numerous amounts of successful quantum memory [1] and remote quantum entanglement experiments [2].

With the development of nanofabrication technology, accessing single rare-earth ions becomes feasible by using high quality factor nanocavities [3][4]. The strong light-matter interaction opens a new door for the rare-earth ions, enabling single-photon generation and light-matter gates.

Here, I want to discuss our recent efforts to realize a rare earth ion-nanocavities system and share our preliminary results.

References

- [1] De Riedmatten H, et al. *Nature*, 2008, 456(7223): 773-777.
- [2] Lago-Rivera D, et al. *Nature*, 2021, 594(7861): 37-40.
- [3] Raha, Mouktik, et al. *Nature communications* 11.1 (2020): 1-6.
- [4] Kindem J M, et al. *Nature*, 2020, 580(7802): 201-204.

Figures

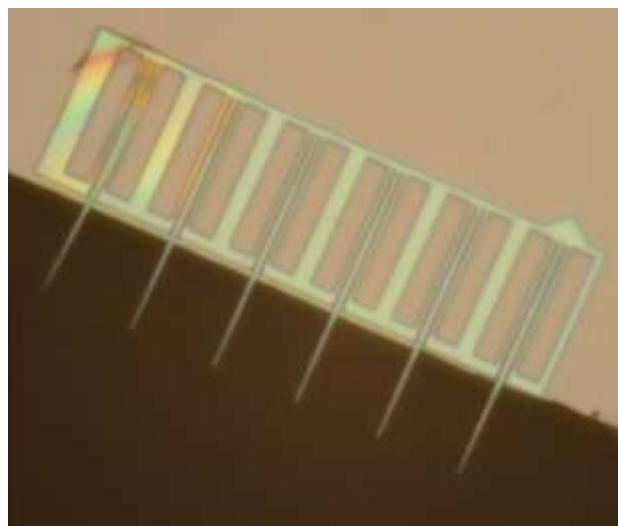


Figure 1: Nanocavities on the Er:LiNbO₃
