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Entrapment of magnetic micro-crystals for on-chip ESR studies
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On-chip Electronic Spin Resonance (ESR) of magnetic molecules requires the ability to precisely position nanosized samples in antinodes for a maximum magnetic coupling. A method is developed to entrap micro-crystals containing spins in a well defined location on the substrate surface. Through the use of photolithography, this method has achieved positioning of single to tens of crystals with micron scale resolution. The method has allowed Q-band EPR measurements of a 175 micron diameter single crystal of BDPA at 34 GHz. Polycrystalline diluted Cr^{5+} spin $1/2$ systems [1] have been entrapped in 500 micron squares for which the lower limit of the EPR measurement sensitivity was approached. This method gives way to on-chip ESR measurements at dilution refrigerator temperatures by allowing the samples to be positioned inside an on-chip superconducting cavity. [1] N. Sarita et al, Phys. Rev. Lett. 99, 137601 (2007).

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