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Optomechanics of suspended magnetic van der Waals materials

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The persistence of a magnetic order in a monolayer of van der Waals magnetic material has been established in 2016, offering the perspective to embed a magnetic degree of freedom in heterostructures made of other bidimensional materials such as graphene or light-emitting transition metal dichalcogenides. The physical properties of van der Waals materials can be easily tuned by perturbations like strain or doping, inviting to the exploration of magnetism in two dimensions and its exploitation in novel ultrathin devices.
Our approach is to suspend these magnetic materials forming drum-like resonators in order to investigate the influence of the strain on their magnetic order. We probe magnetic phase transitions in homo- and heterostructures based on $FePS_3$ and $NiPS_3$, two materials from the transition metal thiophosphates family displaying a zigzag antiferromagnetic order, combining nano-optomechanics to optical spectroscopies.
The tuning by strain of their light emission and magnetic properties is also investigated, in particular the photoluminescence of $NiPS_3$.
This work opens to the study of proximity effects in van der Waals magnetic heterostructures and their control by strain.

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