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Effects of magnetic field and pressure in magnetoelastic stress reconfigurable thin film resonators for magnetic field sensing PETER FINKEL, MARGO STARUCH, Naval Research Laboratory — The magnetic response of microdevices is significantly enhanced at structural resonance allowing for improved sensitivity and signal-to-noise ratio. The magnetic field resolution of these devices can be further improved when operating in vacuum due to an increase in mechanical quality factor. In this work, free-standing CoFe thin film doubly clamped stress reconfigurable resonators were investigated as a function of magnetic field and pressure. A large uniaxial anisotropy resulting from residual uniaxial tensile stress was revealed from magnetic hysteresis loops with the easy magnetization axis aligned along the length of the beams. The quality factor of the driven resonator beams under vacuum is increased by 30 times which is expected to lead to improved signal to noise ratio, combined with a predicted reduction in the intrinsic magnetic noise by a factor of 6 potentially reaching as low as ˜25 pT/$\sqrt{}$Hz at 1 Torr. Stress reconfigurable sensors operating under vacuum could thus further improve the limit of detection and advance development of magnetic field sensing technology.

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