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Optical and mechanical properties of titania-silica coatings

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The lower limit in sensitivity of gravitational wave detectors at their most sensitive frequencies arises from the Brownian motion of high reflectivity coatings on the test mass optics. In the aim to find alternative materials for the next upgrade of interferometric detectors, large interest was represented by Titania-doped Silica. We present here our investigations into the mechanical and optical properties of highly-reflective coating stacks made of pure SiO₂ and TiO₂ doped SiO₂, deposited via ion beam sputtering (IBS). Two different concentrations of TiO₂ doping in the high-refractive index layers of our coating stacks were investigated, with mechanical loss and optical absorption being measured through different steps of heat treatment for each, with the level of coating thermal noise being calculated from the former.

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