

Optical absorption of TiO_2 doped SiO_2 as a replacement high index coating material

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The sensitivity of 3rd generation gravitational wave detectors is currently projected to be limited by the level of Brownian coating thermal noise produced from highly reflecting mirror coatings. In the current detectors layers of Ta_2O_5 , a material with higher refractive index ($n = 2.14$), has higher levels of optical absorption compared the lower index layers of SiO_2 ($n=1.44$). To improve detector sensitivity and duty cycle, the optical and mechanical properties of new doped coating materials are being investigated. This work presents measurements of the optical absorption of SiO_2 and SiO_2 doped with TiO_2 layers as part of a highly reflecting coating stack. Utilising the photothermal common-path interferometry technique, we discuss the effects of heat treatment and crystallisation on the optical performance of the material compared to current aLIGO coatings.

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