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## Crystalline AlGaAs coatings for future gravitational wave detectors

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The sensitivity of current gravitational wave detector (GWD) such as advanced LIGO is partially limited by thermal noise arising from amorphous silica and titania-doped tantala coatings at their most sensitive frequency band. Future GWDs are planned to employ low thermal noise coatings so that one can explore further into the Universe with improved sensitivity. Crystalline AlGaAs coatings are promising coating candidates for such future upgrades because of their low coating thermal noise. However, the lock acquisition used in current detectors cannot be used due to the narrow band gap of AlGaAs coatings; thus, alternative schemes must be developed. To solve this problem, we propose a new lock-acquisition scheme using a wavelength-doubled laser. We have produced dichroic AlGaAs mirrors to enable this new lock acquisition scheme and are characterizing their performance. In addition, we have investigated the mechanical loss of AlGaAs coatings at cryogenic temperature using a cryogenic gentle nodal suspension system. We will present the results of cryogenic AlGaAs mechanical loss measurements and the current status of the development of dichroic AlGaAs coatings toward future GWDs.

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