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Real-time monitoring of thermal annealing as a tool to enhance the properties of coatings for GWD mirrors.

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Enhancing the performance of GWD mirrors is a complex endeavor which entails several key steps, including the selection of a suitable mirror design, the choice of the most appropriate chemical composition of coatings and the protocol for post-deposition treatments –i.e., thermal annealing.
During more than two decades of continuous research and development [1,2], a lot of effort has been dedicated to understand and optimize the first two steps, while thermal annealing has remained a mandatory yet somewhat poorly-understood process. Indeed, the beneficial effects of thermal annealing have been studied mostly by ex-post analysis, that is, by probing the coatings before and after the annealing [3]. The lack of information about the real-time evolution of the coatings during the annealing means that the parameters used in the annealing protocol used to produce the current GWD mirrors might not be optimized, potentially leading to sub-optimal performance.
In this work, we present the real-time monitoring of the coatings during thermal annealing as a valuable tool to deepen the understanding of the annealing process, and most importantly, to provide guidelines for the optimization of the annealing protocol [4]. In this presentation, the real-time monitoring of the annealing of Ti:Ta2O5 - the high-index material currently used in GWD mirrors - will be presented and discussed. The ultimate goal is to apply this real-time analysis to each of the materials that are currently under evaluation as possible substitutes for Ti:Ta2O5, to make sure that their properties after the annealing are the best attainable for GWD applications.

References

[1] Penn S. D. et al., Class. Quant. Grav. 20, 2917 (2003)
[2] Harry G. M. et al., Class Quant Grav 27, 205 (2007)
[3] Amato A., Magnozzi M. et al., ACS Appl. Opt. Mater. 1, 395 (2023)
[4] Colace S., Samandari S., Granata M., Amato A., Caminale M., Michel C., Gemme G., Pinard L., Canepa M. and Magnozzi M. Class. Quant. Grav. 41, 175016 (2024)

Primary authors: Prof. CANEPA, Maurizio (Università di Genova); MAGNOZZI, Michele (Istituto Nazionale di Fisica Nucleare); Ms SAMANDARI, Shima (Università di Genova); Mr COLACE, Stefano (Università di Genova)

Co-authors: Dr AMATO, Alex (Maastricht University); Dr MICHEL, Christoph (LMA); Dr GEMME, Gianluca (INFN Sezione di Genova); Dr PINARD, Laurent (LMA); Dr GRANATA, Massimo (LMA); Dr CAMINALE, Michael (Università di Genova)

Presenters: MAGNOZZI, Michele (Istituto Nazionale di Fisica Nucleare); Ms SAMANDARI, Shima (Università di Genova)

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