Title: Development of ECR ion beam deposition for next-generation optical and functional thin films.

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Abstract: Ion beam deposition (IBD) is typically the method of choice for the manufacture of Bragg reflectors with extremely low levels of optical loss. As one example, gravitational wave detector mirrors require high-reflectivity, through use of multilayer dielectric coatings, that necessitate sub-ppm absorption over large area. However, the Brownian thermal noise of typical coating materials, due to the mechanical dissipation, remains too high to enable future gravitational wave detectors to fully reach their quantum-limited sensitivities. For this reason, the University of Strathclyde have pioneered a new IBD process, to extend the available parameter range during manufacture, in addition to providing additional potential benefits. This technique utilises electron cyclotron resonance (ECR) plasma generation, and an extraction geometry which yields a cleaner and more precisely controlled extraction for generating an energetic ion beam for sputtering. This technique has been used to fabricate the lowest optical absorption amorphous silicon in the world; k=1.2x10-5 at 1550nm, a factor 100 lower than standard RF-IBD. The presentation will also highlight how the bandgap of HfO2 films can be further extended, relevant to laser damage performance, in addition to the manufacture of high *sp*3 content diamond-like carbon (DLC) for possible use in biomedical implants.

Bio: Professor Stuart Reid is a Royal Society Industry Fellow and the Head of Biomedical Engineering at the University of Strathclyde, and leads a multidisciplinary team working across astrophysics and stem cell research. He has spent the last 19 years developing technology for gravitational wave detectors, and is co-inventor of "nanokicking", where precise nanoscale vibrations are used to control the behaviour of adult stem cells which can be used to grow bone in the lab from a patient's own cells. The Sir Bobby Charlton Foundation is funding the first-in-human surgical application of this technology, for helping landmine survivors. Further clinical trials are underway where nanoscale vibrations are applied directly to patients for possible treatment of osteoporosis. His lab develops next-generation laser mirrors and holds the world-record for the optical performance in amorphous silicon coating technology. He is Director of the Centre for Extreme Performance Optics Coatings (EPOC) that resides within the newly formed National Manufacturing Institute Scotland (NMIS), developing coating solutions in collaboration with industry for applications including gravitational wave observatories, biomedical implants, next generation fluorescence imaging, and Raman spectroscopy