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Thin films to mitigate multipacting

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Multipacting in particle accelerator elements such as drift tubes, superconducting radiofrequency resonating cavities (SRF), couplers⋯is a major challenge. The multipacting phenomenon is strongly dependent on the surface total electron yield (TEEY) and developing thin film coatings materials to reduce the surface TEEY is of critical importance. In most cases however, the surface dissipation induced by the RF field is also a critical parameter and the thin film electrical conductivity has to be tuned accordingly. For each application, an optimal set of TEEY and the conductance values is required. In order to be able to control both independently, a possible solution is to develop a thin film heterostructure based on the mixing of a low TEEY, electrical conductor material with a high TEEY, dielectric material in order, for instance, to obtain a low TEEY, dielectric coating that will prevent both Multipacting and a decrease of surface losses quality factor. We choose Atomic Layer Deposition method to achieve that goal and we will present results obtained with coatings made of multiple layers to verify that this solution is relevant. Electrical conductivity and TEEY measurements carried out on these multimaterial multilayered coatings shown that, effectively, both properties vary according to their composition and their structure

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