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Flexible glass planar structures fabricated by rf-sputtering

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Abstract. We present flexible SiO_2/HfO_2 one-dimensional photonic crystals, fabricated via radio frequency sputtering. The structural, morphological, and optical features of the samples were investigated. One of the most remarkable finding lies in the experimental evidence showing that even after breakage, with visible cracks forming in the flexible glass, the multilayer structures largely retain their integrity.

The benefits in terms of cost efficiency and versatility achieved through the development of flexible and stretchable electronics and optoelectronics, in contrast to rigid systems, have greatly fuelled the exploration of flexible photonic technologies. Introducing mechanical flexibility to photonic structures enables novel functionalities, further broadening their already extensive range of applications. Alongside advancements in flexible photonics based on organic platforms, an emerging approach is gaining attention, emphasizing the use of inorganic, all-glass ultra-thin structures. For oxide-based materials, their intrinsic properties, such as transparency, high thermal resistance, and chemical stability, can be harnessed within appropriate systems.

In this study, we present flexible SiO_2/HfO_2 one-dimensional photonic crystals, fabricated via radio frequency sputtering. These systems exhibit a pronounced dependence of their optical properties on the angle of light incidence, particularly demonstrating a blue-shift of the stopband and a narrowing of the reflectance window.

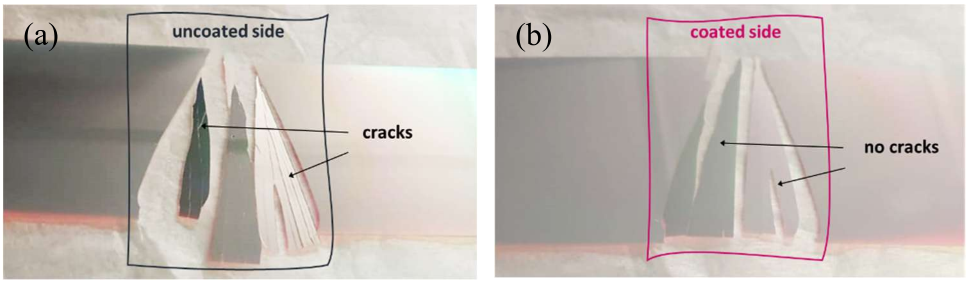

Fig. 1. 1D SiO_2/HfO_2 multilayer structures fabricated on ultrathin AS 87 eco SCHOTT glass by RF magnetron sputtering after substrate break (a) photo of the uncoated side; (b) photo of the coated side.

However, the most remarkable finding lies in the experimental evidence, as display in figure 1, showing that even after breakage, with visible cracks forming in the flexible glass, the multilayer structures largely retain their integrity. This positions them as promising candidates for flexible photonic applications due to their robust optical, thermal, and mechanical stability. [1,2].

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