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Optimization, design and preparation of metal–dielectric multilayer coatings for optical elements

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Large variety of optical elements are base on multilayer coatings. Often, they are consisting of low and high refractive index layers such as metal oxides or metal fluorides. Formation of these multilayer (>20 layers) coatings could be very complicated; it requires high precision and process control. Additionally, optical properties of every single layer may be influenced by the preparation conditions [1]. Recently, it was reported that optical elements could be made with the use of ultrathin metal and metal oxide/fluoride layers.
In current research, as an example of optical component we selected non-polarizing beam splitter (nPBS). For nPBS formation ultrathin metal and niobium oxide layers were deposited by magnetron sputtering. Firstly, it was optimized preparation of each layer. Niobium oxide films were prepared with the high deposition rate by the use of reactive magnetron sputtering with a feed-back optical emission monitoring [2]. Secondly, in-situ growth of metal layer was investigated. Conditions for ultrathin continuous metal film formation were found. Thirdly, a new cube broad-angle nPBS device was designed, prepared and characterized.
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