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Properties of silicon nitride thin overlays deposited on optical fibers – effect of fiber suspension in radio frequency plasma-enhanced chemical vapor deposition reactor

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Abstract

This work discusses the effect of sample suspension in radio frequency plasma-enhanced chemical vapor deposition process on properties of the obtained overlays. Silicon nitride (SiN_x) overlays were deposited on flat silicon wafers and cylindrical fused silica optical fibers. The influence of the suspension height and fiber diameter on SiN_x deposition rate is investigated. It has been found that thickness of the SiN_x overlay significantly increases with suspension height, and the deposition rate depends on fiber dimensions. Moreover, the SiN_x overlays were also deposited on long-period gratings (LPGs) induced in optical fiber. Measurements of the LPG spectral response combined with its numerical simulations allowed for a discussion on properties of the deposited overlay. The measurements have proven higher overlay deposition rate on the suspended fiber than on flat Si wafer placed on the electrode. Results of this work are essential for precise tuning of the functional properties of new generations of optical devices such as optical sensors, filters and