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**Study of silver grown by magnetron sputtering in reactive gas and plasma characterization of the sputtering process**Jiri Bulir<sup>1</sup>, Michal Novotny<sup>1</sup>, Jan Lancok<sup>1</sup>, Petr Pokorny<sup>1</sup>, Michal Bodnar<sup>2</sup><sup>1</sup>Institute of Physics, ASCR, Prague 8, Czech Republic <sup>2</sup>Czech Technical University in Prague, Prague, Czech Republic

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Silver is one of the most suitable materials for a fabrication of metal-dielectric and plasmonic optical devices due to its unique optical constants. The final performance of such devices significantly depends on a quality of the silver structure, which is mainly influenced during the initial nucleation of the silver on the substrate. Moreover, the nucleation process is significantly influenced by presence of the reactive gas and the plasma parameters. Therefore we focused our attention on a systematic study of the plasma parameters and its correlation to the mode of the silver nucleation at different sputtering conditions. The silver layers were deposited by RF magnetron sputtering in a mixture of Ar and reactive gas ( $O_2$ ,  $N_2$ ). The initial stage of the nucleation and the layer growth was studied by means of the optical monitoring, which is based on a principle of spectrophotometric measurement of the sample reflectivity. The measured data were fitted to a mathematical model. The mode of the layer nucleation (Volmer-Weber or Stranski-Krastanov) was clearly distinguished in the monitored data. The plasma was characterized by means of mass spectroscopy and optical emission spectroscopy. The formation of plasma species was related to the observed mode of the layer nucleation.

**Keywords**

Silver

Magnetron Sputtering

Mass Spectroscopy

Optical Emission Spectroscopy