Nanostructured surfaces

Nanoporous covering based on anodic alumina for sensory applications

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A metal-clad waveguide (MCWG) sensor [1,2] with a nanoporous waveguiding layer on a metal cladding layer is advantageous in sensing of biomolecules because of a high surface area of nanopores and a sharp dip in the reflection spectrum due to characteristics of the MCWG mode. Promising for sensors are films of porous anodic alumina (PAA). PAA porosity, thickness, size of pores may be controlled by the modes of anodic oxidation and etching for widening of pores. An advantage also is PAA stability in solutions with physiological pH .

Here, a MCWG sensors with the Kretschmann geometry on a glass substrate PAA/Al and Au/PAA/Al are presented (Fig. 1). The developed technology includes a magnetron deposition of the adhesive layer of niobium (1 - 3 nm) and film of aluminum (250 - 500 nm), the formation of PAA waveguide layer and semitransparent Al film by anodic oxidation, widening of pores by chemical etching and coating of Au (5-15 nm) by thermal evaporation.

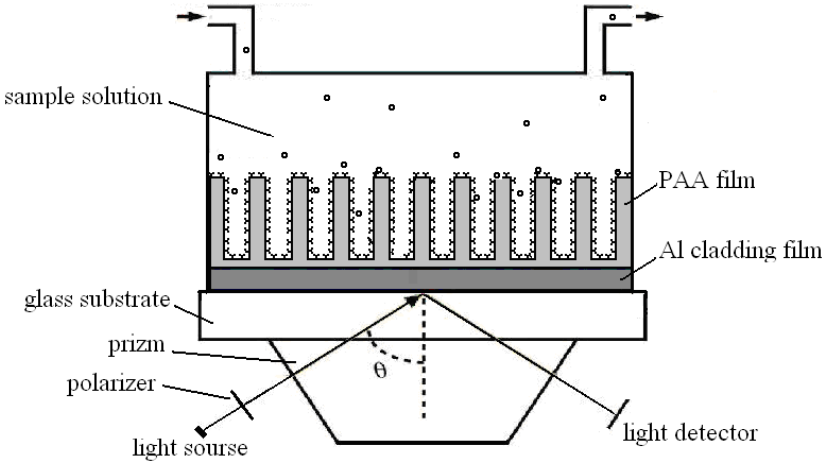

Fig. 1. Schematic illustration of the MCWG sensor based on the PAA/Al.

The technique of the optical properties controlling of PAA/Al *in-situ* during anodic oxidation and etching using "Plasmontest" device were developed. Investigations of PAA/Al and Au/PAA/Al structures by SEM and AFM were carried out. Preliminary immunochemical studies on MCWG biosensors PAA/Al and Au/PAA/Al show the perspectives for further development.

1. *Yamaguchi A., Hotta K., Teramae N.* Optical Waveguide Sensor Based on a Porous Anodic Alumina/Aluminum Multilayer Film // Anal Chem.- 2009.- **81**.- P. 105–111

2. *Войтович И.Д., Лебедева Т.С., Курлов С.С., Шпилевой П.Б.* Оптические биосенсоры на многослойных тонкопленочных структурах // Электроника и связь.- 2010.- N 2.- С. 174-179