Chemical and electrochemical formation of nanostructured aluminium mesh for display applications

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Nowadays, deposited indium-tin oxides (ITO) are the industrial standard materials for display applications. These materials possess good optical transparency and electrical conductivity. However, the deposition of the ITO films is a costly process demanding complicated equipment. An electrochemical anodization of thin aluminium layers can manufacture adoptable transparent conductors for display. In this case, the anodization is accompanied by the formation of porous alumina layer on metal surface. At a moment when the bottoms of pores reaches sodium glass the rest of the metal presents an invisible Al mesh [1]. Furthermore, anodization of thin aluminium is one of low cost processes in industry.

In this work nanostructured aluminium mesh was produced by a simple anodization of aluminium, which was carried out in oxalic acid solution at a voltage of 50 V. The duration of anodization was determined by the current drop. Oxide films were removed by chemical etching in a mixture of 5 wt. % H_3PO_4 and 2 wt. % H_2CrO_4 at 30 °C for 0.2 h. The acid resistant paint was dissolved in acetone after anodization [2].

Typical SEM image of invisible aluminium meshes after anodization and chemical etching is shown in Fig.

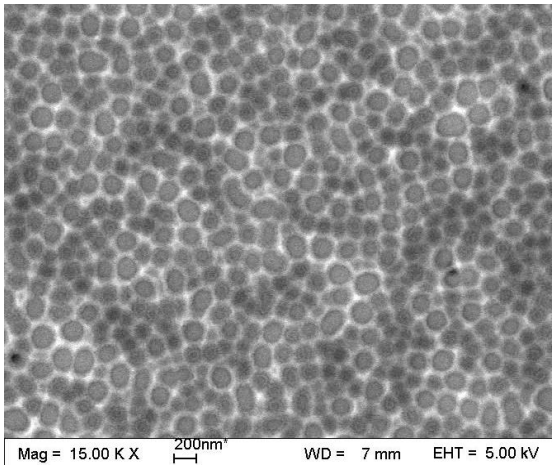

Fig. SEM image of invisible Al meshes after Al anodization
in 0.3 M oxalic acid and chemical etching

Defects in hexagonal arrangement of the mesh were caused by deference in the rate of the self-organized growth of pores. Conductivity of invisible meshes was determined by the thickness of the rest of aluminium nanostructure. These nanostructures can be used for the production of display devices.

References

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2. W. J. Stępniowski, Z. Bojar. *Surface & Coatings Technology.* (2011) 265.