CREATION OF POROUS STRUCTURE ON CORUND SURFACE

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It is well known that traditional polymer track membranes may be used at low temperatures. So creation of high-temperature membranes is of great interest.

One of the main problem is choosing material and its etching. In this work we used thin crystals of Corund (α -Al_2O_3), which possess rather high melting temperature (2000°C) and chemical stability. Next step was etching of the sample and creation porous structure on Corund surface. In our early articles [1,2] we proposed so-called "thermo-chemical dissolution" of Corund. This process is reaction of Corund with carbone oxide during the high-temperaure heating. Chemical reaction in this case can be schematically written as:

$$2\,Al_2O_4 + 12\,CO \rightarrow Al_4C_3 + 9\,CO_3$$

This reaction leads to solving of Corund surface. Varying etching conditions (heating time and temperature, crystallographic orientation) we can change the microrelief.

We used mechanically polished samples of Corund (non-oriented crystals) and irradiated by Ar-ions (with the energy 1 MeV/nucl.) "to mark" them, i.e., to make preliminary destructed areas. Next step was chemical etching of these "marked" crystals at the atmosphere of CO. Then we investigated etched surface of crystals at the scanning electron microscope TESLA BS-340. Thermal evaporation of metal (Ag) in vacuum was used for creation thin electrical-conductive layer on the surface of samples.

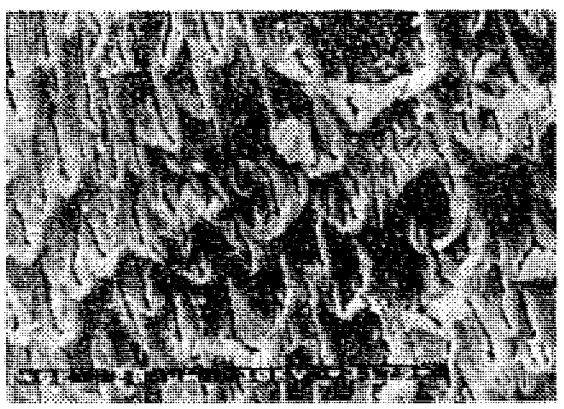

Fig. 1

Different position of samples in microscope and changing of samples orientation during microscopic investigation gave us an opportunity to make space image of crystal surface. Microphotography is presented in Fig.1.

Pores were rather different in size and

had average size: length 20-40 μm, width 8-10 μm and depth 5 μm - i.e., they were dead-end and had rather small depth. Walls of pores were very smooth.

This porous structure is a result of irradiation of Corund by heavy ions, because the control sample, which was not irradiated but only etched, had rather plane surface.

We propose a new method of creation of porous surface which also may be used for creation atomicly-smooth secondary structure.

REFERENCES:

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2. Smirnov A.E., Urusovskaya A.A., Govorkov V.G.,Berezkova G.V., J.of Mat.Sci., 1981, Vol.16, pp. 1071-1080.