CONTROL OF THE PARTICLE SIZE DISTRIBUTION AND THE INVESTIGATION OF THE CRYSTAL STRUCTURE OF THE TITANIUM OXIDE POWDERS, OBTAINED BY PLASMADYNAMIC METHOD

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At the present time, titanium oxide (IV), such as TiO_2 (titanium dioxide) is widespread in many industries. It is used in the production of solid films in photocatalysis and solar energy; in addition, titanium dioxide has found its application in both chemical and pharmaceutical production [1-4].

An important problem is the development of methods for the direct synthesis of a finely dispersed phase, since it is possible to achieve improved characteristics of titanium dioxide only in a nanoscale form [5].

This paper shows a method for obtaining ultrafine powder by plasmodynamic synthesis. The main advantages of this method are the speed of the process (10^{-3} sec.), the absence of the need for preliminary preparation of the material and its constant dosing. Also, the method is environmentally friendly and safe.

The synthesize product without any preliminary preparation was investigated by x-ray diffractometry. The fig. 1 shows the diffraction pattern of the synthesized material and cards of the proposed phases. The analysis was performed using a Shumadzu XRD7000 X-ray diffractometer (CuK_α radiation) equipped with a counting monochromator. The full-profile analysis was carried out in the "PowderCell 2.4" software environment and the PDF4+ structural data base. Two crystal modifications of TiO_2 have been identified: anatase $aTiO_2$ with tetragonal syngony (no. 21-1272) and rutile $rTiO_2$ also with tetragonal syngony (no. 21-1276). There is a broadening of the peak in the range of 53.8 ÷ 54.5 degrees. However, its separation into 2 phases is clearly visible: $aTiO_2$ and $rTiO_2$.

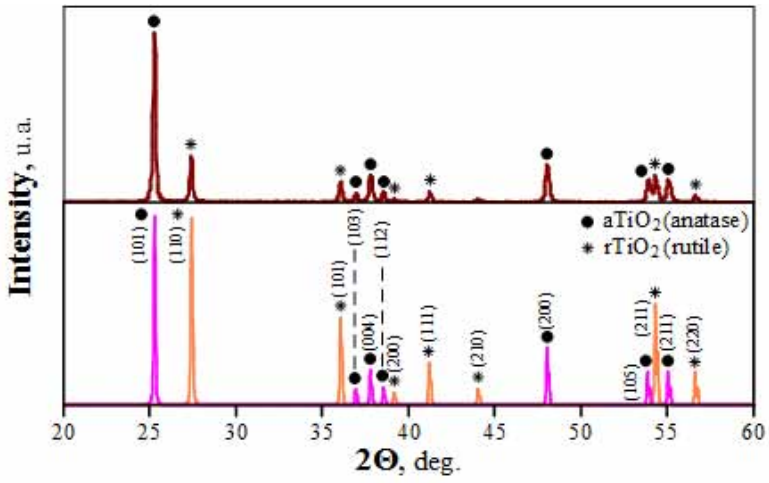

Fig. 1. Diffraction patterns of obtained material and proposed phases

The paper has shown the results about the synthesis of ultrafine titanium dioxide. X-ray phase analysis has determined the presence of 2 crystalline modifications of titanium dioxide: anatase with tetragonal syngony and rutile with the same syngony.

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