Obtaining Titanium Dioxide of Rutile Form of Crystal Lattice from The Solutions Contained Fluorammonium Titanium Complex Salts

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***Abstract* - The process of obtaining titanium dioxide of rutile form of crystal lattice using different rutilated additional components has been investigated. The obtained samples have been examined with the help of X-ray diffraction (XRD) and atomic-emission analysis (AEA).**

***Key words* - ammonium hexafluorotitanate, atomic-emission analysis, X-ray diffraction analysis, rutilization, hydrated titanium dioxide**

I. INTRODUCTION

Titanium dioxide occurs in nature in three major crystalline modifications. The rutile represents the highest commercial interest. Rutile form of titanium dioxide is weatherproof and protects polymers from ultra-violet rays, thus preventing photocatalysis and loss of properties of the material (for example: destruction and discoloration), and possesses the best covering power. Only TiO_2 of rutile form of crystal lattice is a unique and an unalternative white pigment in standard areas of the industry to impart whiteness and covering power.

II. MATERIALS AND METHODS

It is known that the titanium dioxide of rutile form is easily obtain, it is only needed to choose a rutilated additional component that will provide easier recrystallization of anatase to rutile under a lower temperature. However, there are insufficient data on the application of additional components in flour-containing solutions.

The obtaining of rutile form the solutions of fluorammonium complex salts of titanium by the reactions of ammonium hydrolysis requires calcinations of hydrated titanium dioxide under the temperature more than 1000 ^oC [1].

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Using fluorammonium technology it is hard to obtain pure ammonium hexafluorotitanate due to the formation of fluorammonium titanium complex salts. Carrying out the sublimation fraction of iron and titanium components under the high temperature in 750-800 ^oC the dust loss of the iron component of the ilmenite occurs. The contain of Fe_2O_3 in amount of 0,003 % impart a yellowish colour to the pigment. Therefore regarding hydrated titanium dioxide sedimentation one should pay attention to the formation of rutile form and reduce the sedimentation of the iron component.

It is known that fresh-sedimented hydroxides are the sorbents[2]. The sorbtion of three-valent ferrum on the surface of hydrated titanium dioxide is possible to reduce by its reduction to Fe^{2+}. It is also known that the existence of the F^- - ion decreases the rutilazation, but stabilises the anatase form and increases the temperature of the hydrated titanium dioxide calcinations.

For the investigation of the process of titanium dioxide of rutile form of crystal modification obtaining it was necessary to explore the influence of these rutilated additional components:

1. Rutilization of $AlCl_3$ (2-% solution);
2. Rutilization of Al + HCl ;
3. Rutilization of Zn + HCl ;
4. Rutilization of Zn + HCl with the addition of titanium hydroxide ($Ti(OH)_2$);
5. Addition of ZnO, Cr_2O_3, Al_2O_3, SiO_2 oxides and others for F^- ion coupling.

As a result, the obtained samples were investigated using X-ray diffraction (XRD) on X-ray diffractometer XRD-7000S and atomic-emission analysis (AEA) on the atomic emission spectrometer iCAP 6300 Duo.

III. RESULTS AND CONCLUSION

The results of the samples investigation using AEA revealed that in weighed portion №1 Fe and Al contained the amount of 0,24 % and 0,64 % respectively, the amount of Ti contained 59,90 %; in weighed portion №2 the content of Fe is 0,09 % , Al is 1,95 % and Ti is 59,98 %.

With the help of the results obtained by the XRD application it was revealed that the rutilated additional components №3 and №4 are the most conducive for obtaining rutile titanium oxide. In the experiment №5 the

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addition of Cr_2O_3 and SiO_2 doesn't contribute to the production of rutile form of TiO_2.

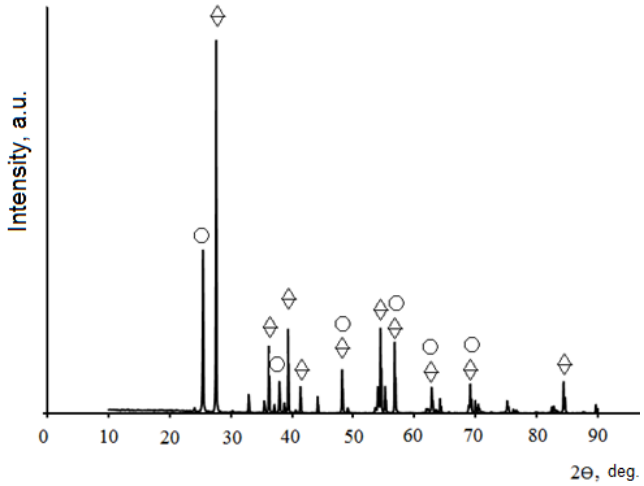

Fig 1. Diffraction pattern of sample №4 – а) : ◈ – TiO_2 (rutile), ○ - TiO_2 (anatase).

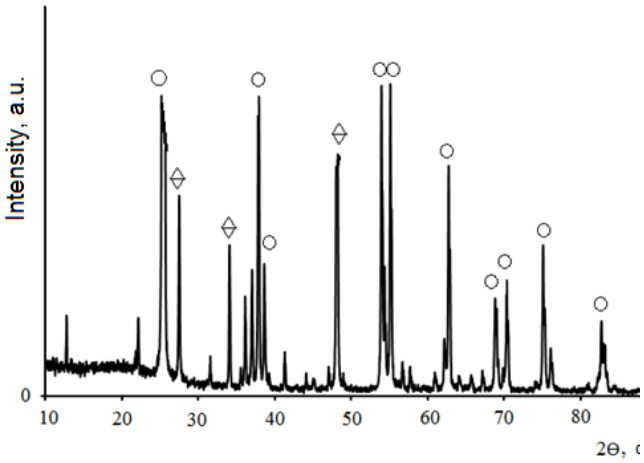

Fig 2. Diffraction pattern of sample №5 – б): ◈ – TiO_2 (rutile), ○ - TiO_2 (anatase).

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