Russian Titanium

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The situation regarding titanium is paradoxical. On the one hand, titanium is found in abundance in the natural environment: in terms of natural occurrence in the earth's crust, the element is the third among all metals, directly following iron and aluminium. In industry, particularly in metallurgy it is used very rarely, about one hundred times less than aluminium.

This happens in spite of the outstanding properties of titanium: it is lightweight, fast, heatproof and chemically stable. But it is too expensive as it is very difficult to extract it from minerals, and the raw materials for its production are extremely expensive.

It came to having to purchase titanium dioxide from abroad. It is used as a basis for titanium white, and the production of plastics, paper and even cosmetics. There are enough deposits in Russia; the problem is that Russia has not yet managed to establish the production of high-quality raw titanium.

This stumbling block will probably be removed soon with the help of the technology developed in the Baikov Institute of Metallurgy and Material Authority, Russian Academy of Sciences(IMET RAS), in the laboratory of Professor Reznichenko by G.B. Sadykhov, Doctor of Science (Engineering).

The rutile mineral is found in nature, it mainly consists of titanium dioxide. The researchers suggest that rutile should be educed from the so-called leucoxene petroliferous sandstones of the Yaregskoye deposit,

which was previously considered absolutely hopeless for obtaining titanium dioxide.

The method of production is as follows: first, it is necessary to get rid of mineral oil the sandstone is imbued with. This mineral oil has been distilled off from Yaregsky sandstone by heating it without air. Then, the sandstone is heated once again; this changes its structure. The sandstone initially consists of over half ordinary sand, i.e. silicon dioxide - quartz. The latter is distributed irregularly: there are large agglomerates, and some agglomerates are as if ingrown in the rutile structure, they are the most difficult to get rid of. As a result of thermal treatment, the silicon dioxide structure changes, and it becomes much more active.

Strange as it may seem, rutile acquires ferromagnetic properties and starts to be pulled to the magnet. The researchers do not yet know for sure the reason for this happening, so far there is only a hypothesis that this is connected with minor iron admixtures. Finding out the reasons for this phenomenon is the subject of further research. However, the phenomenon has been persistently proved experimentally and it allows to separate rutile from quartz. As for silicon dioxide remaining with rutile in thin conglutination, it is much easier to remove – it is washed out of rutile by alkali solution.

As a result, the researchers manage (so far, only in a laboratory environment) to educe practically all titanium dioxide from ore, i.e., 90 to 95 percent of the initial content, and such synthetic rutile proves practically pure: it contains more than 90 percent of titanium dioxide and less than three percent of silicon dioxide. It is pure pleasure to get titanium white from such rutile.

Source: Informnauka