STRUCTURED AND PHASE MECHANISMS OF OXIDATION ILMENITE AND FERRIILMENITE ON AIR: EXPERIMENTAL AND STRUCTURED MODELING

D.A.Khramov, V.S.Rusakov*, N.N.Eremin**
Vernadsky Institute of Geochemistry and Analytical Chemistry RAS, Moscow, Russia
*Department of Physics, Moscow State University, Moscow, Russia
**Faculty of Geology-Crystallography and Chemistry, Moscow State University, Moscow, Russia

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Study of mechanism of oxidation ilmenite ($FeTiO_3$) causes an essential interest as from standpoints of understanding of processes to evolutions minerals, so and from positions inorganic materials. Exactly experimental modeling of similar processes under controlled by T, P, fO2 - conditions allows in principle restore picture of formation and following change minerals. Besides, partly oxidized ("20% Fe^{3+}) ilmenite (ferriilmenite) are refered to the class of new perspective magnetic material - concentrating spin-echo glass (CC). Parameters of transition in the condition CC to a considerable extent are near order defined by particularities of in the system. So for correct understanding and prediction of magnetic characteristics such CC it is necessary to know ion localization particularities Fe^{3+}, as far as exactly this defines possible mechanisms an frustration in the system.

In this work by methods an Mossbauer spectroscopy (MS) ^{57}Fe and computer structured modeling (KSM), studied structured and phase mechanisms of oxidation on air (T = 400 – 950°C) samples ilmenite ($FeTiO_3$) and ferriilmenite with deficit of titanium $Fe_{1.06}Ti_{0.94}O_3$, synthesized at temperature T = 11500 with, characteristic of running the magmetic processes and conditions of getting CC given type. Installed that process of oxidation ilmenite and ferriilmenite under T = 400-600°C passes two parallel fetters: 1) by turning the ions Fe^{2+} in the condition Fe^{3+} in the structure of mineral; 2) by the separation of phases gematite and rutile in amounts ≈ 8% (400°C) and ≈22% (600°C). On the base given MC Herewith and structured modeling the most probable are presented following schemes local charge to compensations: $Fe^{2+} + Ti^{4+} \rightarrow Fe^{3+}(Fe) + Fe^{3+}(Ti)$; $3Fe^{2+} \rightarrow 2Fe^{3+}(Fe) + V(Fe)$. At the temperature of oxidation T = 700°C structure ilmenite completely disintegrates with formation rutile, gematite and $Fe_2Ti_2O_7$ phases. The most further increasing of temperature of oxidation (800-950°C) does not bring about the appearance of new phases, but only causes a changing their correlations.

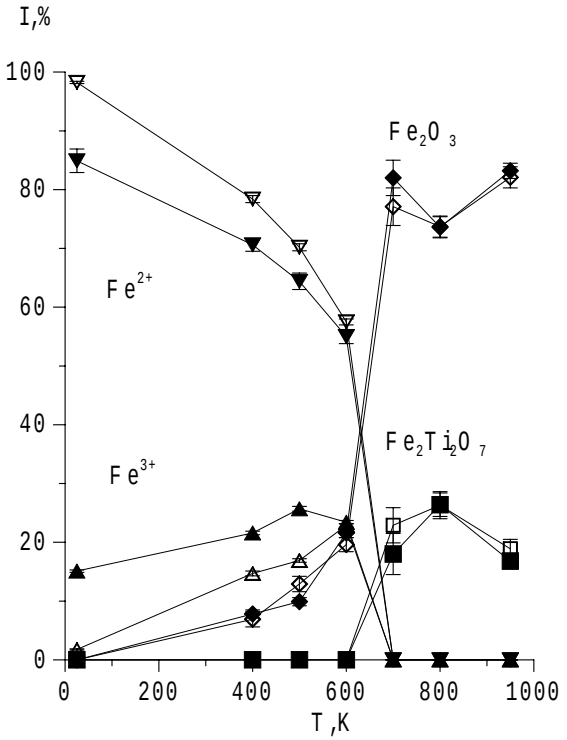

Fig.1. Changing a contents of atoms two- and trivalent ferric in the structure ilmenite (light badge) and ferriilmenite (dark badge), as well as correlation of phases a-Fe_2O_3 and $Fe_2Ti_2O_7$, formed in the system in the process of oxidation of source samples $FeTiO_3$ and $Fe_{1.06}Ti_{0.94}O_3$