ELGYGYTGYN CRATER (CHUKOTKA, RUSSIA). PROBLEM OF IMPACT VOLCANISM OF THE EARTH

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Most of researchers consider the findings of highly dense SiO_2 phases - stishovite and coesite in ring structures of the Earth to be of cosmic nature. Detail geologo-geophysical and petrologo-geochemical study of the Elgygytgyn impact crater has been carried out. Elgygytgyn Lake caldera (18km across) is in the center of a vast rise (about 200km) composed of a thick (more than 4km) complex of volcanic rocks of Middle Cretaceous to Late Pliocene age. Picrite-alkali-basaltic dikes with peridotite inclusions and impactites (breccias, pumices, glasses, etc.) are found in the caldera and outside it. Impactites contain the minerals with diaplectite glasses and planar structures. Grains of high-chrome spinel, magnesian garnet, stishovite, and coesite, and high content of reduced gases (hydrogen and methane) were found in the inclusions in minerals. H/C ratio is about 2. Glasses contain fluids and show structural immiscibility of melts: appearance of interbeds with different oxide and contrast gas content. Characteristic is high sulfur (0.64%) and chlorine content typical of volcanic eruptions. Analysis of microelements and REE content, isotopy of strontium, neodymium, oxygen, and hydrogen, and mineral and gas inclusion composition indicate endogenous nature of impactites. Modeling of gas equilibria suggests explosive nature of chemical compounds of reduced gases (H2, CH4), probably, with the participation of metastable deep-seated heavy hydrocarbons. Explosive and transient chemical reactions (chain reaction) create high T-P (about 2000°C and 100kbar) conditions in the centers under volcanoes. Volcanism parameters and evolution are similar to the plume volcanism pattern with the elements of chemical processes (not adiabatic) explosion of gases at the final stage.