

IMPACTS INTO SHALLOW WATER AND FORMATION OF SMECTITE CLAYS: EXPERIMENTAL EVIDENCE

1 GERASIMOV M. V., 2 DIKOV Yu. P., 3 YAKOVLEV O. I., 4 WLOTZKA F. 1
Space Research Institute, Moscow Russia; 2 IGEM, Moscow Russia, 3 Vernadsky
Institute of Geochemistry, Moscow Russia, 4 MPI Chemie, Mainz Germany

The formation of K/T boundary deposits is connected with the impact of an asteroid sized body in shallow oceanic water. The Chicxulub event is the most probable candidate. A main component in the K/T layer are smectite clays. The aim of the present experimental work was to check the possibility of smectite clay formation during an impact. Our experimental approach included small scale impacts using a light-gas gun facility and simulation of impact vaporization by a laser pulse technique. We used a wide range of targets including different silicate types from ultramafic to acidic and various salts modeling specific sediments. Chicxulub target rocks were simulated by mixtures of Mg- and Ca-carbonates, Ca-sulfate.2H₂O (gypsum), Ca-sulfate, silica and alumina. Water was introduced into the system by its presence in gypsum. The surface layers of condensate films (analysed by XPS) obtained with targets containing gypsum show distinct features indicating the presence of hydrous silicates. The energy distance between the Si 2p and Al 2s XPS lines was 17.2 eV, typical for hydrous aluminosilicates. The experiments show a complex chemistry in the vapor cloud, resulting in: 1) Noticeable trapping of S, C, and H₂O by condensing products; 2) formation of Mg and Al sheet silicates only in experiments with water containing targets; 3) strong reduction processes in experiments with water containing targets. These experimental results indicate the regular formation of hydrosilicates of Mg and Al and of smectite clays as impact cloud condensates.