Aluminum hydride $\alpha$-AlH$_3$ (alane) is a solid with very large hydrogen content of 10.1% by weight. Aluminum hydride is a promising additive to rocket fuels and high explosives and so need for knowledge of its properties under high pressures and temperature appears. Aluminium hydride has been intensely studied as one of the most promising materials for hydrogen storage.

The large hydrogen content of AlH$_3$ leads to other interesting properties. It is well known that dense monoatomic hydrogen would be probably a room temperature superconductor. Some recent calculations put onset of metallization in solid hydrogen with the superconducting critical temperature $T_c = 225$ K at pressures 450 GPa [1]. These high pressures are far away from the current experimental limit for static pressures and low temperatures and also far away from the current experimental limit for shock pressures. There is another possibility to create a dense net of light elements which would have metallic conductivity. It was noticed [2] that "light" hydrides (such as CH$_4$, SiH$_4$, AlH$_3$, or MgH$_2$) might indeed be high-Tc superconductors. Theoretical [3] and experimental [4] studies of alane AlH$_3$ have investigated possible metallization at high pressures along the room temperature isotherm. The results obtained are sufficiently encouraging to prompt studies of a wider range of temperatures.

In this paper, the electrical conductivity of AlH$_3$ has been studied under multi shock compression up to 100 GPa. The conductivity of shocked alane increases in the range up to 60-75 GPa and is about $30 (\Omega \text{cm})^{-1}$. In this region the semiconductor regime is true for shocked alane as well as for multi shocked hydrogen [5]. The conductivity of alane achieves approximately $500 (\Omega \text{cm})^{-1}$ at 80-90 GPa. The conductivity is interpreted in frames of the conception of the "dielectric catastrophe" [6], taking into consideration significant difference between electronic states of isolated molecule AlH$_3$ and condensed alane.

This work was supported by the program “Thermophysics and mechanics of strength impulse effects” of the Presidium of the Russian Academy of Sciences. 

The Authors thank V.F. Degtyareva and E.M. Apfelbaum for fruitful discussions.