THERMODYNAMIC AND TRANSPORT PROPERTIES OF HYDROGEN UNDER MULTIPLE SHOCK COMPRESSION UP TO THE PRESSURES 120-140GPa.

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A serie of experiments was done in which hydrogen was multiple shock compressed up to the pressures 120-140 GPa. Final temperature changed from 3000 to 6000 K depending on the initial density of hydrogen.

Optical emission and resistance of hydrogen were measured during the compression. Experiments were compared with the results of 1D gasdynamic calculation.

Was constructed semiepirical multi phase equation of state of hydrogen. Equation of state of gaseous hydrogen was constructed in the fluid variation model. Dissociation of hydrogen was treated in the assumption that interaction energy of particles does not depend on the sorts of neighbors. Constructed equation of state of gaseous hydrogen is in a good agreement with experimental data for single shock compressed hydrogen.

To evaluate experimental data for density and conductivity of multiple shock compressed hydrogen equation of state of hydrogen plasma was constructed. It was assumed that electrons of hydrogen in plasma state are delocalized. Electron density on the atomic cell boundary in plasma state differs significantly from the electron density on the atomic cell boundary in the gaseous state of hydrogen. This prevents mixing of gaseous and plasma states of hydrogen. Was constructed gaseous – plasma hydrogen equilibrium curve. According to the constructed model conductivity of hydrogen have to decrease with the increase of temperature for the fixed pressure of the order 130 GPa.

In current experiments was registered decrease of conductivity of hydrogen from the level 300 1/Ohm/cm for the temperature 3000K to the level 30 1/Ohm/cm for the temperature 6000K. This results are in qualitative agreement with the predictions according to the constructed equation of state of hydrogen.