Shear Viscosity of Nonideal Plasma

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This work is devoted to analysis of the behavior of the shear viscosity of strongly coupled electromagnetic plasma. Systems with strong coupling have a small viscosity compared to weakly coupled plasmas in which the viscosity is proportional to the mean free path. Today a huge array of experimental data on the thermodynamic, transport and optical properties of strongly coupled plasma was received, but there are no direct measurements of viscosity. For our purposes experimental data on measurements of electrical conductivity of hydrogen, deuterium and rare gases under intense shock compression and under quasiisentropic compression in multistep loading up to megabar pressures are the most interesting. The data on hydrogen, deuterium and helium-hydrogen mixture, received in the region of "metallization" at P~150 GPa in different experimental systems by the method of quasiisentropic compression reach the values $\eta/s \sim (0.3\text{-}10)\, Q_L$. Thereby, the hydrogen plasma in the region of "metallization" possesses the lowest values of the shear viscosity to the entropy ratio. Note that in this case we have an extremely high value of the coupling parameter - $\Gamma \sim 20\text{-}80$. It is shown, that the data on electrical conductivity of strongly coupled electromagnetic plasma, confirm the tendency of decreasing of the viscosity η/s with an increase in the correlation (Γ) and thus confirm trend of the transition of the physical system to the perfect frictionless fluid with the increasing of the interparticle interaction.