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PRESSURE-TEMPERATURE IONIZATION OF NONIDEAL PLASMAS

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Abstract. The physical properties of strongly coupled plasmas at high pressures and energy densities are analyzed in a broad region of parameters. The theoretical and experimental methods of non-ideal plasma investigations are discussed. Main attention is paid to the dynamical methods. Intense shock, rarefaction, and radiative waves in solid and porous samples, and electrical explosion were used for generation of high density plasmas at extremely high pressure. The pressure ionization plasma phenomena in hydrogen, helium, noble gases, iodine, silica, sulfur, H_2O, fullerenes and some metals are analyzed on the base of multiple shock wave experiments. The data obtained were described by the non-ideal plasma model taking into account increase of charge carrier number as a result of "temperature" and "pressure" ionization. In contrast to these experiments the multiple shock compression of solid Li, Ca and Na shows strong modification of electron plasma energy spectrum and as a result of that - dielectrization of these elements at megabars. The "plasma" phase transition phenomena are analyzed on the base of shock experiments and quantum Monte-Carlo simulations.