To the theory of electrostatic probe in dusty plasma generated by a volume source of fission fragments

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In the present paper, the theory of electrostatic probe in nuclear induced dusty plasma is regarded. The grains are equally small by their mass and size .The charging process in the plasma is limited by interaction of dust grains and electrons by quasi neutrality condition and total gain's charge is equal to  and reaches its maximum values up to [1].We define the ratio of electrons concentration and positive ions concentration in the undisturbed region by the probe field as  ,which also should be obtained. The nuclear induced plasma in the core of nuclear reactor is created by the following nuclear reaction .In the present paper the theoretical analysis developed to get the detailed explanations of the probe diagnostics technique of negative grains in plasma mixtures like ,where the electrons and negative grains are presented in unknown proportion.

Plasma created by fission fragments was initially described in the following papers by Leffert C.B, Reese D.B., Nguyen D.H., Grossman L.M. and Guyot J.C., Miley G.H., Verdeyen J.T.[4-6]. In the present paper probe diagnostics theory is developed for dusty plasma diagnostics [7] and might be applied to probe diagnostics of dusty plasma where the mixture of 3He + dusty grains in the gas sample inserted in the flux of thermal neutrons absorbs thermal neutrons creating highly energetic particles which cause in its own turn the ionization of the working medium .In case of mixture of helium and some dusty grains the affinity processes will prevail and strongly depend on the energy of electrons. The charging process is will be counterbalanced by recombination processes and may lead to some unknown value of dusty grain’s charge. The charge of dusty grain is also will affect sufficient changes while it’s moving gradually to positive probe. So the density of negatively charged grains will drop in the positive charged layer as well as its charge and this functional dependence will be balanced by electro’s energy distribution and practically stopped due to the high energy of primary electro’s in this layer which is about ionization potential. So in the present probe theory focused to the determination of positive ions density, electrons density and negative charged dusty grain’s density as well as to the average dusty grain’s charge.

References

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