Erratum

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Basic physics of colloidal plasmas

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In this addendum/erratum the author rectifies the notational error in subscript of Z appearing at a few places of the above-mentioned article. With proper correction eq. (6) is rewritten in a more suitable form as given below:

$$1-\frac{Z_i}{(1-p)}\left(\frac{c_s}{v_P}\right)^2\left[\frac{1}{1-\frac{v_{ti}^2}{v_P^2}}+Z_I\frac{m_i}{m_I}p\frac{1}{1-\frac{v_{tI}^2}{v_P^2}}\right]=0, \tag{1}$$

where $v_P=\omega/k$, and $Z_i=q_i/e$.

This form of dispersion relation for long wavelength acoustic modes in impure plasmas could be used to delineate the different classes of collective degrees of freedom of acoustic nature in limiting cases of impurity charge concentration ratio i.e. p.

In the lower limit of $p\to 0$, the correct expression of the acoustic dispersion relation as mentioned in eq. (7) of the above publication reads as

$$\omega^2\approx Z_ik^2c_s^2+k^2v_{ti}^2. \tag{2}$$

For non-isothermal case $(T_e\gg T_i, T_I)$ this reduces to

$$\omega^2\approx Z_ik^2c_s^2\approx k^2c_s^2 \quad \text{for} \quad Z_i=1.$$

Now, in the case of upper limit of $p\to 1$, the two additional degrees of freedom of collective acoustic dynamics are likely to be produced as discussed in the text of the above publication. The origin of these can be described by the appropriate choice of the relevant parameters for physical realization of the finite value of the second term in eq. (1).

For example, the choice of $v_P\to\infty$ simplifies the eq. (1) to describe the dispersion behavior of the modified ion-acoustic wave (as given by eq. (8) in the above publication) with corrected notation as

$$\omega^2\approx Z_i\frac{k^2c_s^2}{(1-p)}\left(1+Z_I\frac{m_i}{m_I}\right)\approx\varepsilon_n\left(1+Z_I\frac{m_i}{m_I}\right)k^2c_s^2 \quad \text{for} \quad Z_i=1. \tag{3}$$

This is to note that the validity domain of plasma parameters for modified ion-acoustic wave is constrained by long wavelength approximation as well as by the hydrostatic distribution (Maxwell–Boltzmann distribution) condition of the electron dynamics.

Similarly, the other choice for $p\to 1$ considers the tendency of entire term within the square bracket of eq. (1) to go to zero. This has been discussed in the publication by eqs (9) and (10). This is to clarify that the estimation of rescaled space and time scales of the acoustic modes due to impurity ions on page 845 of the publication has been carried out for $Z_i=1$.