Theoretical Study on the Nuclear Reactions in Solids by Calculating Quantum States of the System Including Two Species of Charged Bosons in Ion Traps.

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We can estimate the nuclear reactions in solids by solving the problems of the charged bosons trapped in the crystal. They are approximately characterized by the harmonic potential around the trapped site and repulsive potentials between bosons [1]. The nuclear reaction rates are obtained from the overlaps of the wave functions.

In this study, we have considered the new method how to perform the numerical calculations for the problems on the mixtures of the positively charged bosons in ion trap, which was proposed by Kim et al. [2, 3]. In their problems, the electro-static potential and the number density of each boson are linked with each other and we cannot solve it by usual simple method. Therefore, we have introduced self-consistent iterative calculations for the coupled two equations corresponding to the two species of positively charged bosons. In this method, the Schrödinger's equation and the Poisson's equation were solved alternately.

The numerical calculations for the systems including deuterons and Li ions, deuterons and Ni ions and some other cases have been done. Through the calculations, the dependency of the wave functions on the valence or mass of the charged bosons were obtained. The nuclear reaction rate for each case was also obtained.

References

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