

## ABSTRACT

Although nuclear clusters such as deuterons and other heavier clusters exist in nuclear matter at low density and moderate temperatures, they undergo the Mott transition and get dissolved due to the medium effects as the density of nuclear matter increases. For the deuteron, the Pauli blocking is found to be the prominent factor that mostly affects the deuteron binding energy especially at low density. The energy shift due to the Pauli blocking is found to be strongly dependant on the CM momenta of the deuterons in the system. The theoretical methods, which were previously used, ignored the deuteron CM motion due to the difficulties associated when taking this motion into account. In this work, an approach is developed using the methods of quantum and statistical mechanics to study the system of deuterons existing in a vapor of nucleons. The method used made it easy to take all kinds of CM motion into consideration especially those of the deuterons. It was found that assuming nonzero CM momenta of the deuterons, which makes the study more realistic, increases the Mott densities at different temperatures.