Optimization of the BCS model for small systems and thermodynamic properties of $^{96-97}$Mo

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Abstract
In this paper, we have presented the optimized BCS formalism using the isothermal probability distribution. The effect of statistical fluctuations on thermodynamical properties of $^{96-97}$Mo nuclei has been investigated. The average gap parameter is calculated and then the energy, the entropy and the heat capacity are evaluated. The resulting values are compared with results of the standard BCS and the Static Path Approximation plus Random Phase Approximation, (SPA+RPA). We have shown that the resulting heat capacity versus temperature using the optimized BCS model is very similar in shape to the experiments in the other models. The peak in the heat capacity is interpreted as the transition from the paired to the normal phase.

Keywords: BCS, statistical fluctuations, isothermal probability distribution, $^{96-97}$Mo

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