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# A NOVEL APPROACH FOR TAKING INTO ACCOUNT THE ZERO-POINT OSCILLATIONS IN CALCULATING HEAVY-ION FUSION CROSS-SECTIONS

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It had been shown [1] that accounting for the zero-point oscillations (ZPO) of the shape of colliding complex nuclei results in increasing substantially the calculated sub-barrier capture (fusion) cross-sections. Calculations in [1] was made in a simplified way with a schematic nucleus-nucleus potential.
In the present work we develop an advanced method for taking into account the ZPO of quadrupole mode for both collision partners. Within this method we evaluate the sub-barrier capture cross-sections for several reactions and compare the results with the experimental data.
In our novel approach, the nucleus-nucleus bare potential results from the semi-microscopic double-folding model with M3Y-Paris nucleon-nucleon forces [2,3]. For this aim, we generalize the earlier published code [4]. In this generalization, we heavily rely on Ref. [5].
The nucleon densities come from the Hartree-Fock-Bogoliubov calculations [6]. For each collision partner, about 10 quadrupole deformations are accounted for with the appropriate probabilities. The transmission coefficients are evaluated by means of the WKB approximation below the barrier and using the single parabolic barrier approximation above the barrier.
Neglecting the ZPO typically results in the theoretical sub-barrier cross-sections to be below the data whereas accounting for the quadrupole ZPO often improves the situation.

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## The speaker is a student or young scientist

No

## Section

1. Experimental and theoretical studies of nuclear reactions

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