

Half-lives of α -decay from nuclei with $Z = 92 - 118$ using the double folding model with relativistic NN interactions

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Received 29 October 2021; received in revised form 16 November 2021; accepted 17 November 2021

Available online 23 November 2021

Abstract

The α -decay half-lives of nuclei with $Z = 92 - 118$ have been calculated using the WKB semi-classical approximation. The α -daughter nuclear interaction potentials are obtained from the double folding model, where the effective nucleon-nucleon (NN) interactions are obtained from relativistic mean field theory Lagrangian (R3Y). In addition to using R3Y NN interactions containing only linear σ , ω , and ρ mesons (R3Y-HS), R3Y parametrizations containing non-linear terms (NL2 and NL-SH) are also employed. In fact, they are found to give better descriptions of the α -decay half-lives than R3Y-HS. Moreover, two empirical formulas are employed in the study. They have been included to further test the accuracy of the R3Y models.

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Keywords: Alpha decay; Superheavy nuclei; Double folding model; Relativistic mean field theory

1. Introduction

α -decay, first observed by Rutherford and co-workers, is known to be an important radioactive decay mode that can provide nuclear structure information such as nuclear spin, nuclear parity, and lifetime of nuclei [1–3]. It is useful in the identification of new heavy and superheavy nuclei.

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