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Decay properties of ^{253,255}Rf using the Relativistic Mean-Field Framework.

Most neutron-deficient α-emitters are known to be of great relevance to the astrophysical rapid neutron-capture process (r-process) in superheavy nuclei [1, 2]. Thus, in this work, the decay properties of the newly observed 249No isotope from the α-decay of 253Rf [3] is theoretically investigated within the relativistic mean-field (RMF) framework [4,5] using the NL3* parameter set [6]. The α-decay chain of 255Rf is also considered. The RMF densities are folded with the R3Y NN potential to deduce the nuclear interaction potential between the decaying fragments. A balanced understanding of the penetration of an α-particle across the nuclear-Coulomb barrier gives an outstanding credence to the assumptions of quantum mechanics. The presence of shell/sub-shell closure is indicated by the formation of peaks along the decay chain and found to alter the conventional scaling factor of the preformed cluster-decay model (PCM) [5]. The calculated half-lives are in close agreement with the recent experimental measurement. The sensitivity of the nuclei around the shell closures can provide valuable information about the r-process abundance in this mass region.

[1] P. Hosmer et al. Phys. Rev. C 82, 025806 (2010). https://doi.org/10.1103/PhysRevC.82.025806
[2] V. I. Zagrebaev, A. V. Karpov, I.N. Mishustin, W. Greiner, Phys. Rev. C 84 044617 (2011). https://doi.org/10.1103/PhysRevC.84.044617
[3] J. Khuyagbaatar, H. Brand, R. A. Cantemir, Ch. E. Düllmann, F. P. Heßberger, E. Jäger, B. Kindler, J. Krier, N. Kurz, B. Lommel, B. Schausten, and A. Yakushev, Phys. Rev. C 104, L031303 (2021). https://doi.org/10.1103/PhysRevC.104.L031303
[4] P. Ring, Prog. Part. Nucl. Phys. 37, 193 (1996). https://doi.org/10.1016/0146-6410(96)00054-3
[5] J. T. Majekodunmi, M. Bhuyan, D. Jain, K. Anwar, N. Abdullah, and Raj Kumar, Phys. Rev. C 105, 044617 (2022). https://doi.org/10.1103/PhysRevC.105.044617
[6] G. A. Lalazissis, S. Karatzikos, R. Fossion, D. Pena Arteaga, A. V. Afanasjev and P. Ring, Phys. Lett. B 671, 36 (2009). https://doi.org/10.1016/j.physletb.2008.11.070

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