

Alpha Decay, Shell Structure, and New Elements

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Abstract: We systematically analyze the experimental data of alpha decay in even-even heavy nuclei far from stability and find that the Geiger-Nuttall law breaks for an isotopic chain when its neutron number is across a magic number or there is a deformed subshell. This break can be used to identify new magic numbers of superheavy nuclei. It is also discovered that there is a new linear relation between the logarithm of half-life and the reciprocal of the square root of decay energy for $N=126$ and $N=152$ isotones. It could be a new law of alpha decay for nuclei with magic neutron numbers but the physics behind it is to be explored. The significance of these researches for the search of new elements is discussed.

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Key words: alpha decay, magic number, superheavy element

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