

## Magic numbers in heavy nuclei

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The nuclear shell model plays an important role in the pre-formation of alpha particles. It shows the existence of magic numbers, which predicts the nucleus to form a strongly bound closed shell. When the protons number ( $Z$ ) or the neutrons number ( $A-Z$ ) is equal to 2,8,20,28,50,82 or 126, which are known as the “Magic Numbers”. We have developed a model which we named as S-potential by smoothening the potential well inside the nucleus to the top of the coulomb barrier at the outer side of the potential well. We have studied the alpha decay of some even-even heavy nuclei and the half-lives obtained were found to be in a very good agreement with the experimental data available. The pre-formation factor and the penetration probability were determined by modifying the Gamow’s theory of alpha decay by varying the potential. We have studied the microscopic structure properties for  $^{202-226}\text{Ra}$  and  $^{210-232}\text{Th}$ . It was observed that at  $N=126$  the pre-formation factor and penetration probability decreases with increasing  $N$  which shows that the closed shell effects plays an important role in the alpha formation process. The S-potential was found to be a better model for obtaining the accurate half-lives of heavy nuclei.

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