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Surface contours and shapes of Super Heavy Elements (SHE)

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The enormity of data obtained in scientific experiments often necessitates a suitable graphical representation for analysis. Surface contour is one such graphical representation which renders a pictorial view that aids in easy data interpretation. It is essentially a two-dimensional visualization of a three-dimensional surface plot. Very recently, it has been shown that Super Heavy Elements can exist in a variety of shapes - spherical, spheroidal and ellipsoidal with or without shape co-existence. The shapes of such nuclei as predicted by us by diagonalizing the triaxial Nilsson Hamiltonian in cylindrical representation and using the Strutinsky-BCS corrections are graphically displayed by surface contours with Origin software. The obtained results are highly useful in the analysis of the stability of the Super Heavy Elements. Further, they yield a surprising result that the doubly magic spherical nucleus after lead (Z=82 and N=126) is SHE (Z=126 and N=184) in the macroscopic-microscopic method itself.

Summary

The potential energy surfaces of Super Heavy Elements are shown very recently to take on shapes - spherical, spheroidal and ellipsoidal [1] by the self-consistent density functional method. These were confirmed by us [2,3] by using the Triaxial Nilsson-Strutinsky-BCS method. The fixing of the doubly magic spherical nucleus after lead in the super heavy region is a current exciting problem. This is resolved in this work by the macroscopic-microscopic method itself for the first time.

References:

[1] S. Cwiok, P. H. Heenen and W. Nazarewicz, Nature 433,705 (2005).
[2] G.Shanmugam, S.Sudhakar and S.Niranjani, Phys.Rev.C 72, 034310 (2005).
[3] G.Shanmugam, S.Sudhakar, S.Niranjani and D.K.Mohapatra, submitted to Phys.Rev.C (2005).

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