

Abstract Submitted  
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**Spectacular confinement induced peculiarities in the structure of semifilled shell atoms**<sup>1</sup> VALERIY DOLMATOV, University of North Alabama — The structure and spectra of atoms, spatially confined by various types of confinements whose sizes are commensurable with an atomic size, have seized minds of theorists starting since early days [1,2] to now [3]. This is because a confined atom concept provides insights into various aspects of interdisciplinary significance [3]. The present article reports on novel discoveries made, specifically, for semifilled shell atoms under confinement. The latter is simulated by a repulsive penetrable spherical potential of an adjustable inner radius  $r_0$ . There, spectacular confinement induced effects termed orbital breathing, fusion, fission, and re-ordering with changing  $r_0$  have been unraveled. The discovered effects are exemplified by calculated data for confined Li( $2s^1$ ), N( $2p^3$ ), P( $3p^3$ ), and Cr( $3d^5 4s^1$ ). The underlying physics for the effects is explained.

[1] A. Michels, J. de Boer, and A. Bijl *Physica* **4** 981 (1937)

[2] A. Sommerfeld and H. Welker *Ann. Phys.* **32** 56 (1938)

[3] In: *Adv. Quant. Chem.*, Volumes **57** and **58** (2009).

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