COMPARISON OF EXPERIMENTAL AND THEORETICAL BINDING ENERGIES IN ELECTRONIC SHELLS OF PALLADIUM GROUP METALS

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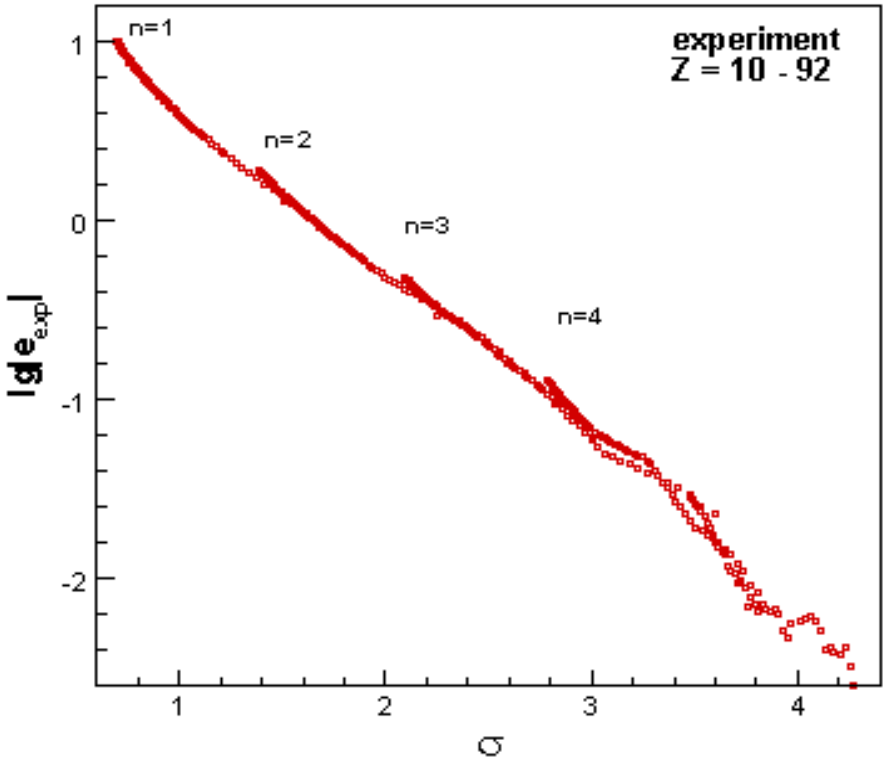
1.1 **Method** for representing **orbital binding energies** in atoms

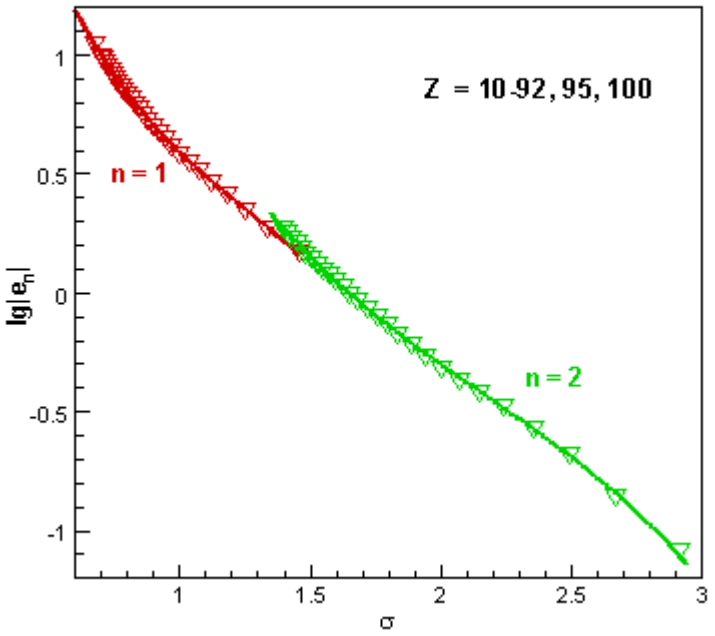
$$e_n(\sigma) = \frac{E_{no}}{Z^{4/3}},$$

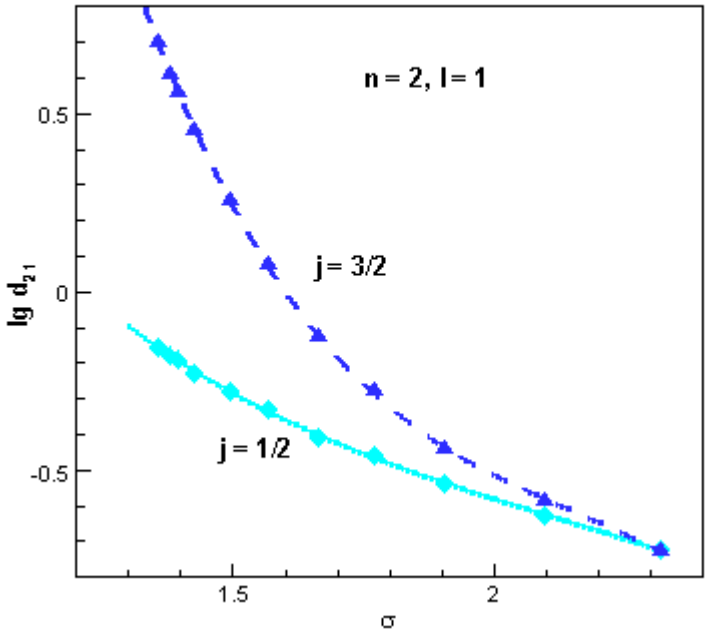
$$d_{nlj}(\sigma) = \frac{E_{n\,lj} - E_{no}}{(l + 1/2)^2 Z^{2/3}}, \quad j = l \mp 1/2$$

1.2 Functions $e(\sigma)$, reconstructed from the experimental **s-levels** E_{n0} for atoms **Z = 10 - 92**



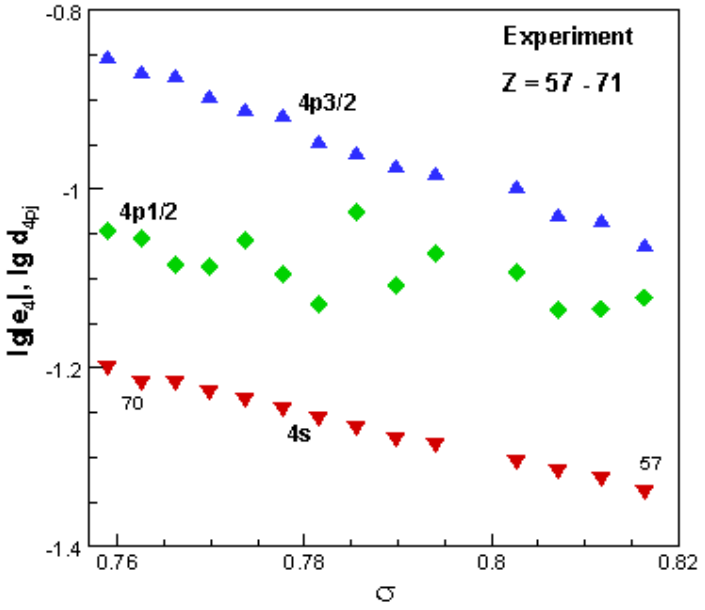
2.1 Functions $e(\sigma)$ and $d(\sigma)$ from in ***K* and *L* shells** in free atoms. *JETP Lett*. **108** 768 (2018)



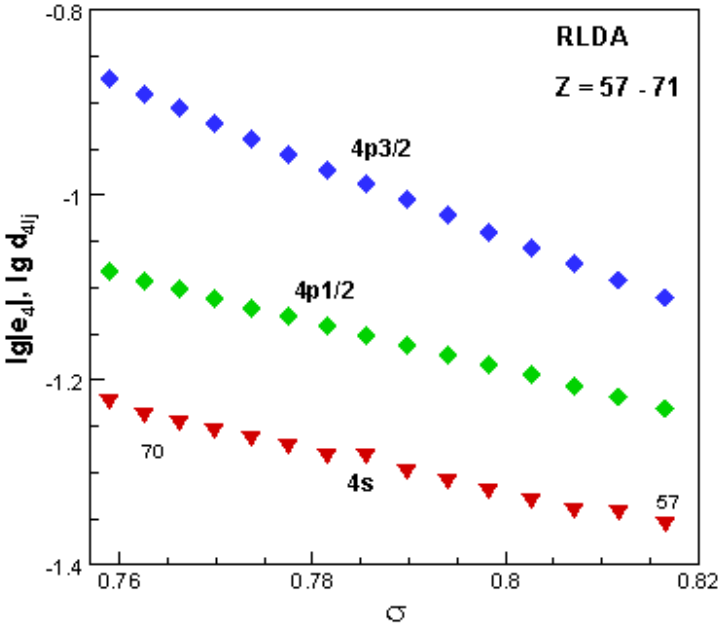


2.2 Subshells 4s, 4p1/2, 4p3/2 in **rare-earth elements** through functions $e(\sigma)$ and $d(\sigma)$. $\sigma = \pi Z^{-1/3}$. *JETP* **131** 385 (2020)

Experiment

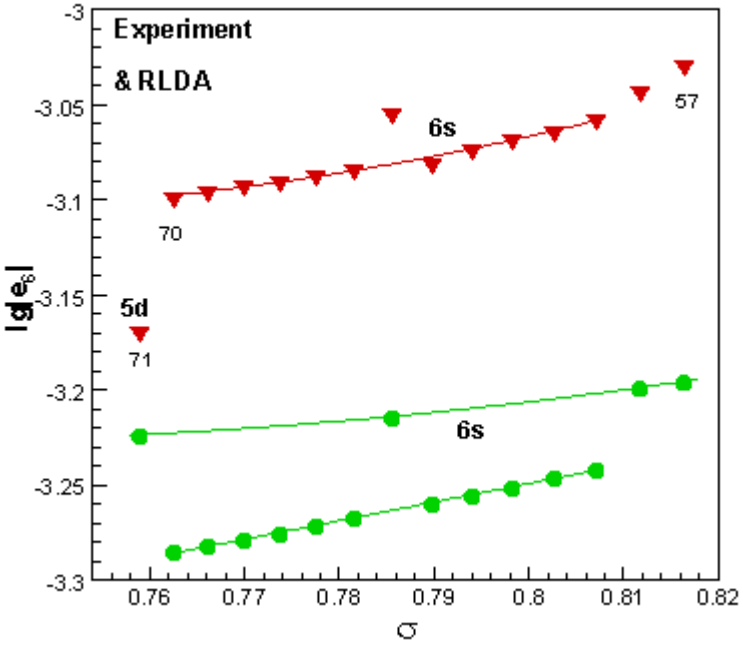


RLDA - calculation

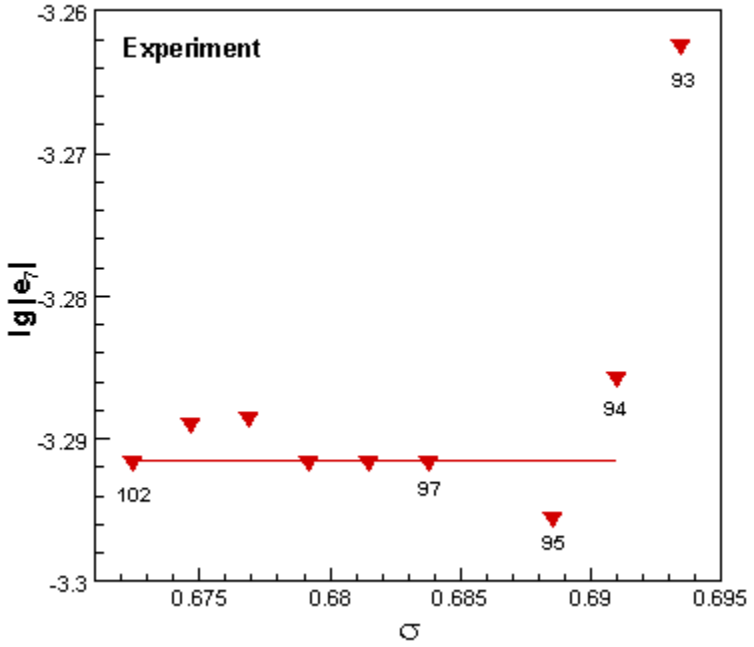


2.3 Measured first potentials of **lanthinides and actinides** through functions $e(\sigma)$ and $d(\sigma)$. $\sigma = \pi Z^{-1/3}$. *JETP Lett.* **111** 463 (2020)

Lanthinides

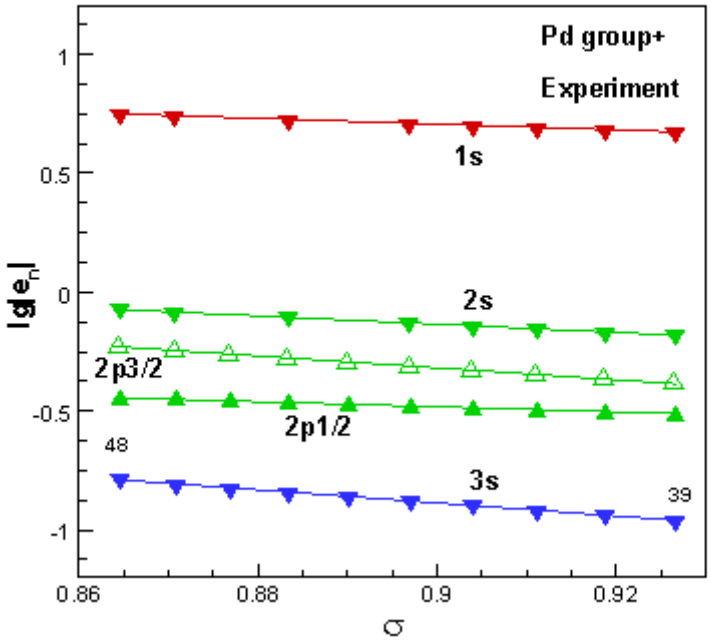


Actinides

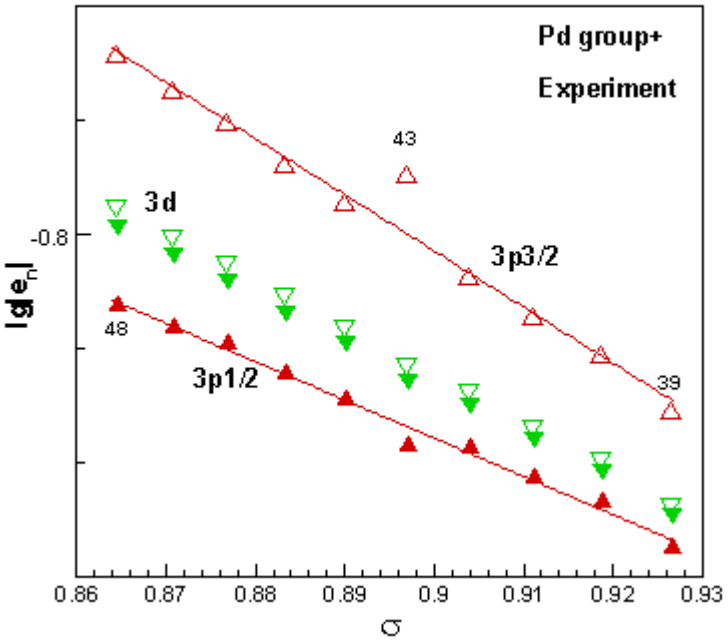


3.1 *K*, *L*, *M* shells in **Pd atomic group** through functions *e(σ)* and *d(σ)*. $\sigma = \pi Z^{-1/3}$.

Experiment: 1s,2s,2p,3s

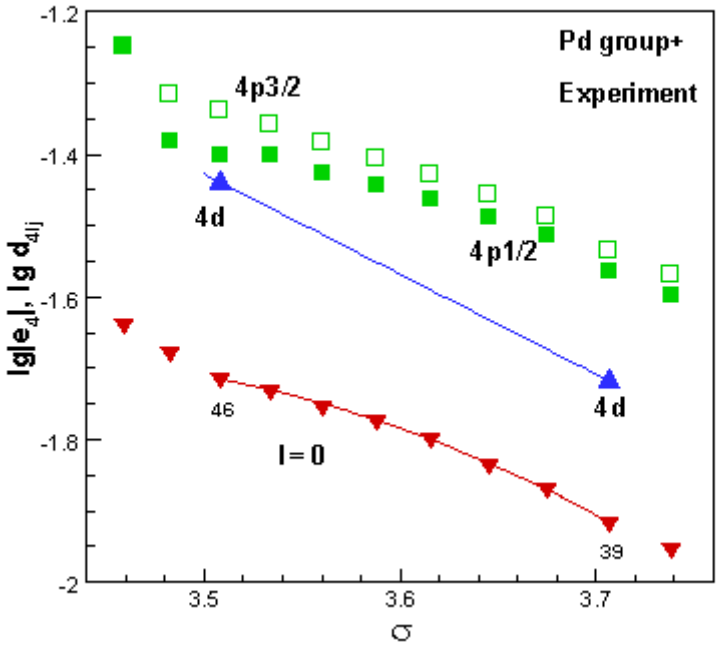


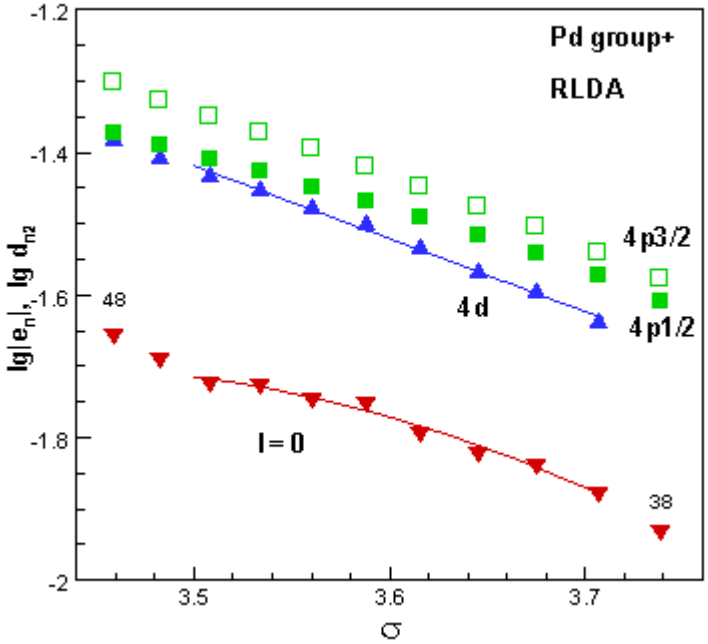
Experiment: 3p, 3d



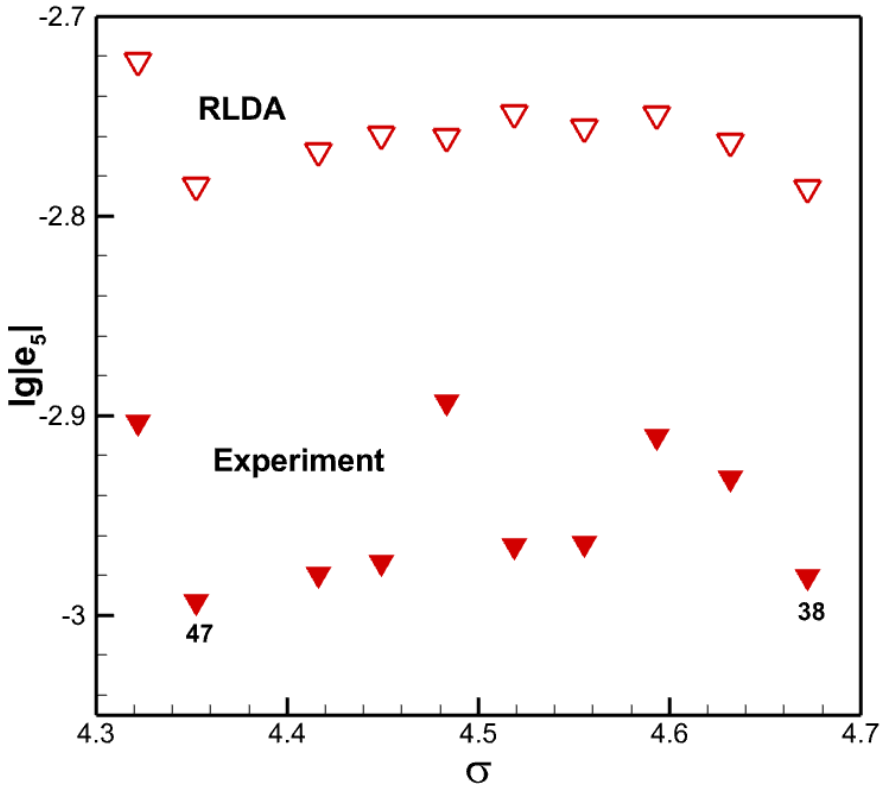
3.2 *N* shell in **Pd atomic group**
through functions $e(\sigma)$ and $d(\sigma), \sigma = \pi Z^{-1/3}$.

Experiment	RLDA - calculation





3.3 Measured and RLDA **first potentials** of **Pd group atoms**



4. Conclusion

1. There are lack and scatter of some experimental data in internal shells of atoms.
2. However most points in the reduced coordinates form smooth dependence on atomic number, that is atomic number similarity law .
3. The deviation from the law raises doubts and needs additional experimental verification.
4. The found atomic number similarity law provide a way to recover missing or erroneous data.
5. The available theoretical RLDA model does not satisfactorily describe the orbital binding energies, which indicates its incompleteness.