

## Nuclear Geometry: from Silicon to Argon

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Received: June 03, 2021

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**Abstract.** The nuclear geometry has been developed by analogy with the fullerene geometry. On the basis of this geometric approach, it is possible to design the structure of silicon, phosphorus, sulfur, chlorine and argon isomers as well as their isotopes, which can be obtained by means of nuclear synthesis. The nuclei can be classed into two groups: basic nuclei having equal number of protons and neutrons, and isotopes having one or two more neutrons. The neutrons decompose into protons and electrons; the latter creating the coat of mail which ensures mechanical stability of the nuclei with respect to shear stresses and thermal vibrations.

### REFERENCES

- [1] *Physical Encyclopedic Dictionary*, ed. by A.M. Prokhorov, Great Russian Encyclopedia, BSE, Moscow, 1995, in Russian.
- [2] A.I. Melker, *Dynamics of Condensed Matter, Vol. 3, Noophysics (Science and Scientists)*, 2006, St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg.
- [3] K. Manolov, *The Great Chemists*, vol. 2, 1976, Mir, Moscow, in Russian.
- [4] A.I. Melker, *Dynamics of Condensed Matter, Vol. 2, Collisions and Branchings*, 2010, St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg.
- [5] [A.I. Melker, Nuclear geometry: from hydrogen to boron, Materials Physics and Mechanics, 2020, vol. 45, no. 1, pp. 132-149.](#)
- [6] R.J. Gillespie, *Molecular Geometry*, 1972, Van Nostrand Reinhold, London.
- [7] *Mathematical Encyclopedic Dictionary*, ed. by Yu.V. Prokhorov, Soviet Encyclopedia, 1988, Moscow, in Russian.
- [8] [N.V. Sidgwick and H.M. Powell, Bakerian lecture: Stereochemical types and valency groups, Proc. Roy. Soc. Series A, 1940, vol. 176, pp. 153-180.](#)
- [9] [J.R. de Laeter, J.K. Böhlke, P. de Bièvre, H. Hidaka, H.S. Peiser, K.J.R. Rosman and P.D.P. Taylor, Atomic weights of the elements: Review 2000 \(IUPAC technical report\), Pure and Applied Chemistry, 2003, vol. 75, no. 6, pp. 683–800.](#)
- [10] [A.I. Melker and M.A. Krupina, Hidden symmetry or why cyclic molecules have so strange forms, Materials Physics and Mechanics, 2010, vol. 9, no. 1, pp. 11-19.](#)
- [11] *Physical Values, Handbook*, ed. by I.S. Grigoriev and E.S. Meilikhov, 1991, Energoatomizdat, Moscow, in Russian.
- [12] N.A. Vlasov, *Neutrons*, 1971, Nauka, Moscow, in Russian.
- [13] M.O. Haggler and M. Kristiansen, *An Introduction to Controlled Thermonuclear Fusion*. 1977, Lexington Books, D.C. Heath and Company.

- [14] A.I. Melker, *Dynamics of Condensed Matter, Vol. 2, Collisions and Branchings*, 2010, St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg.
- [15] A.I. Melker, *Dynamics of Condensed Matter, Vol. 1, Vibrations and Waves*, 2013, St. Petersburg Academy of Sciences on Strength Problems, St. Petersburg.
- [16] V.N. Kondratiev, *Structure of Atoms and Molecules*, 1959, Fizmatgiz, Moscow, in Russian.
- [17] [A.I. Melker, \*Isomers and isotopes of carbon\*, \*Materials Physics and Mechanics\*, 2020, vol. 45, no. 1, pp. 150-166.](#)
- [18] [A.I. Melker, \*Nuclear geometry: from nitrogen to neon\*, \*Materials Physics and Mechanics\*, 2020, vol. 46, no. 1, pp. 149-167.](#)
- [19] [A.I. Melker, \*Nuclear geometry: sodium, magnesium, aluminum\*, \*Materials Physics and Mechanics\*, 2020, vol. 46, no. 1, pp. 168-181.](#)
- [20] [M. Endo and H.W. Kroto, \*Formation of carbon nanofibers\*, \*J. Phys. Chem.\*, 1992, vol. 96, pp. 6941-6943.](#)
- [21] [A.I. Melker and M.A. Krupina, \*Unified approach to forming fullerenes and nanotubes\*, \*Materials Physics and Mechanics\*, 2017, vol. 34, no. 1, pp. 1-17.](#)
- [22] F. Harary, *Graph Theory*, 1969, Addison-Wesley Publishing Co. Reading, Boston.
- [23] [A.I. Melker and M.A. Krupina, \*Modeling growth of midi-fullerenes from C<sub>48</sub> to C<sub>72</sub>\*, \*Materials Physics and Mechanics\*, 2017, vol. 34, no. 1, pp. 29-36.](#)
- [24] A.M. Kosevich, *Physical Mechanics of Real Crystals*, 1981, Naukova Dumka, Kiev, in Russian.
- [25] [A.I. Melker and M.A. Krupina, \*Geometric modeling of midi-fullerene growth from C<sub>24</sub> to C<sub>48</sub>\*, \*St. Petersburg State Polytechnical University Journal. Physics and Mathematics\*, 2016, vol. 2, no. 3, pp. 201-208.](#)
- [26] [A.I. Melker and M.A. Krupina, \*Geometric modeling of midi-fullerenes growth from C<sub>32</sub> to C<sub>60</sub>\*, \*St. Petersburg State Polytechnical University Journal. Physics and Mathematics\*, 2017, vol. 3, no. 1, pp. 22-28.](#)
- [27] A.I. Melker and M.A. Krupina, *Geometric modeling of midi-fullerenes growth from C<sub>40</sub> to C<sub>68</sub>*, *Proceedings of NDTCS- 2017*, 2017, vol. 17, pp. 64-68.
- [28] [A.I. Melker and T.V. Vorobyeva, \*Fusion reactions of cupola half-fullerenes\*, \*St. Petersburg State Polytechnical University Journal: Physics and Mathematics\*, 2016, vol. 2, no. 3, pp. 209-216.](#)
- [29] E.A. MacGregor, *Polymers, Natural*, In: *Encyclopedia of Physical Science and Technology. Vol. 11*, 1987, Academic Press, Orlando, , pp. 85-119.
- [30] [A.I. Melker, \*Fiftieth anniversary of molecular dynamics\*, \*Proceedings of SPIE\*, 2007, vol. 6597, art. 659702.](#)
- [31] [M.A. Krupina and A.I. Melker, \*Unified approach to vibrations and rotations of molecules and macromolecules\*, \*St. Petersburg State Polytechnical University Journal: Physics and Mathematics\*, 2009, vol. 2, no. 77, pp. 112-116.](#)
- [32] [A.I. Melker, A.N. Matvienko and M.A. Krupina, \*Natural isomers of fullerenes from C<sub>30</sub> to C<sub>40</sub>\*, \*Materials Physics and Mechanics\*, 2020, vol. 45, no. 1, pp. 60-78.](#)
- [33] [A.I. Melker, M.A. Krupina and R. M. Zarafutdinov, \*Fullerenes of the An=12 series\*, \*Materials Physics and Mechanics\*, 2017, vol. 34, no. 1, pp. 46-50.](#)
- [34] [A.T. Basilevsky and J.W. Head, \*The surface of Venus\*, \*Reports on Progress in Physics\*, 2003, vol. 66, no. 10, pp. 1699-1703.](#)
- [35] [S.K. Atreya, M.G. Trainer, H.B. Franz, M.H. Wong, H.L.K. Manning, Ch.A. Malespin, P.R. Mahaffy, P.G. Conrad, A.E. Brunner, L.A. Leshin, J.H. Jones, Ch.R. Webster, T.C. Owen, R.O. Pepin and R. Navarro-González, \*Primordial argon isotope fractionation in the atmosphere of Mars measured by the SAM instrument on Curiosity and implications for atmospheric loss\*, \*Geophysical Research Letters\*, 2013, vol. 40, pp. 5605-5609.](#)
- [36] [J.K. Böhlke, \*Variation in the terrestrial isotopic composition and atomic weight of argon \(IUPAC Technical Report\)\*, \*Pure and Applied Chemistry\*, 2014, vol. 86, no. 9, pp. 1421-1432.](#)
- [37] [R.O. Pepin, \*Isotopic evidence for a solar argon component in the Earth's mantle\*, \*Nature\*, 1998, vol. 394, pp. 664-667.](#)
- [38] B.M. Yavorskii and A.A. Detlaf, *Hand-book on Physics*, 1965, Nauka, Moscow, 1965.
- [39] [A.I. Melker, \*Potentials of interatomic interaction in molecular dynamics\*, \*Reviews on Advanced Materials Science\*, 2009, vol. 20, no. 1, pp. 1-13.](#)

- [40] [A.I. Melker and M.A. Vorobyeva \(now Krupina\), \*Electronic theory of molecule vibrations\*, \*Proceedings of SPIE\*, 2006, vol. 6253, art. 625305.](#)
- [41] A.S. Davydov, *Quantum Mechanics*, 1973, Nauka, Moscow.

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