*La materia è il fondamento costituente dei corpi, la sostanza prima di cui tutte le altre sono formate. Quanto viene percepito, ma anche quello che non si è in grado di discernere, è costituito da materia.*

*Architetture della materia è uno spazio per ricerche, teorie, idee, approcci che propongono e sviluppano innovativi strumenti di analisi e contenuti scientifici, con lo scopo di sostenere la sperimentazione e la divulgazione scientifica.*

*I testi della collana studiano la struttura della materia nella sua complessità, sia a livello microscopico che macroscopico. Ne analizzano e descrivono le caratteristiche, le proprietà, le dinamiche e le trasformazioni, utilizzando un approccio che rielabora elementi e concetti teorici di base, consolidati nella letteratura scientifica e trasversali a tutte le discipline interessate.*

tab edizioni

JUSTYNA NIEWIADOMSKA KAPLAR

# *ID* model

## A new theoretical approach to chemical bonds, the structure of atoms and chemical compounds

## Part I. Atomic system: reticular spatial structure as engineering model of atomic shells

**architetture della materia**

# Indice

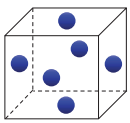
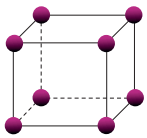
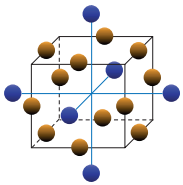
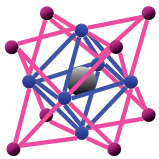
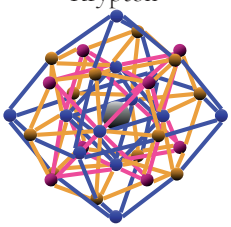
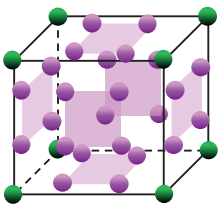
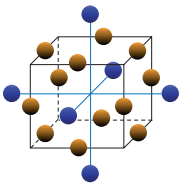
## Abstract

The structure of atoms has been described in this research work by introducing some innovative elementary theoretical concepts such as:

- interpretation of the electron pair not as a concentration of the electron cloud on one side of the nucleus, but as a symmetrical distribution of the electron cloud on both sides,
- hypothesis that in chemical bonds, one electron is shared, not an electron pair,
- interpretation of the transformation of the geometry of molecules in relation to the number of bonds as a result of changes in the spatial relationships between atoms, and not as a result of the hybridization of orbitals and prediction and calculation of the spatial parameters of molecules (topology, bond lengths and angles) by applying trigonometric equations and other geometric rules,
- hypothesis that electrons form atomic shells according to the technique of the multilayer spatial reticular structure, in which the lattice structure develops around a center and where the dynamics between electrons and nucleus and between electrons themselves play precise structural roles:
  - the role of nodes of the reticular structure is performed by localized electrons,
  - the role of rods of the reticular structure is performed by the mutual repulsion of electrons, both inside a shell and between electrons belonging to adjacent layers, which maintains an identical distance between them and makes this distance unalterable within the limits of thermodynamic equilibrium,
  - the nodes of the atomic reticular structure are constrained by the central nucleus through the force of attraction of the nucleus towards the electrons.

The electrons of the atomic shells become localized precisely because they are trapped at a certain distance from the center by means of the mutual repulsion and attraction of the nucleus. The mutual repulsion of a group of localized electrons counteracts the force of attraction of the nucleus and prevents the structure from collapsing.

With this method the localized electrons form atomic shells in the shape of the following polyhedra:

| | | |
|---|---|---|
| octahedron<br>**6** electrons $2p^6$<br>  | cube<br>**8** electrons $3s^2+3p^6$<br>  | cuboctahedron + octahedron<br>**18** electrons $4s^2+3d^{10}+4p^6$<br>  |
| Neon<br>  | Argon<br>  | Krypton<br>  |
| truncated octahedron + cube<br>**32** electrons $5s^2+4d^{10}+4f^{14}+5p^6$<br>  | cuboctahedron + octahedron<br>**18** electrons $6s^2+5d^{10}+6p^6$<br>  | |

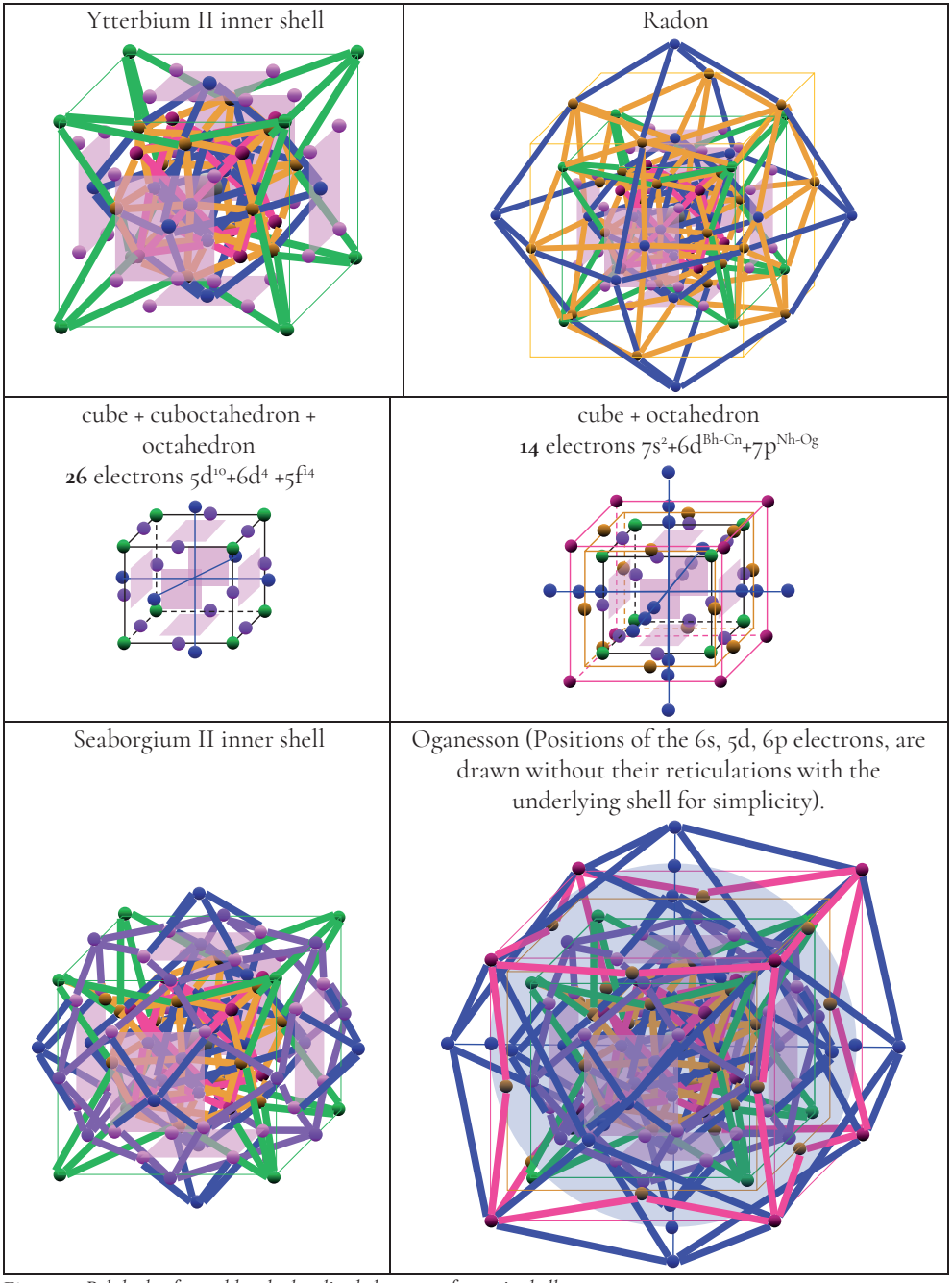



**Figure 1.** *Polyhedra formed by the localized electrons of atomic shells.*

The subsequent shells are built by forming simple or composite tetrahedra between two layers of electrons. The tetrahedron is therefore the structural module of atomic shells.

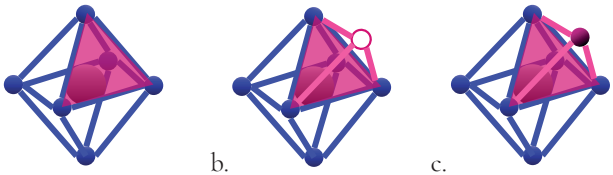



**Figure 2.** *a. Three electrons from the octahedral shell form the regular trigonal base of the tetrahedron which is completed by an electron from the new shell; b. An active site. c. The tetrahedron formed by the new electron and the three electrons from the previous shell.*

The atomic shells of many elements can exist with different structural options which determine different oxidation states. It will be investigated how two oxidation states of the 3p elements are determined by three structural options. The calculation of the atomic radii of noble gases will also be proposed starting from the simple rules of trigonometry. In this volume we focus on the engineering and structural aspects of atomic shells, so some topics are simplified or only hinted at.