

# KURPISHEV LOGIC 2: Final Monograph of the Doctrine

Volume V. Kurpishev Chemistry and Special FOS Reductions: C@C\_chem, Rep\_chem, Evidence-D, Reactions, RBD Graphs and Biosystems

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## **Editorial passport of Volume V**

**Control point.** KLT-DOCTRINE-FINAL-MONOGRAPH-VOLUME-V-CHEMISTRY-EN-v8.0.

**Volume title.** *Volume V. Kurpishev Chemistry and Special FOS Reductions: C@C\_chem, Rep\_chem, Evidence-D, Reactions, RBD Graphs and Biosystems.*

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**Status.** Volume V is the English fundamental edition of the chemical branch of the Doctrine. It follows Volume IV, where the physical reduction of FOS was fixed, and transfers the common core

$$C@C \rightarrow Rep(R, I, U; D) \rightarrow \lambda \rightarrow Status \rightarrow RBD$$

into the chemical domain.

**Editorial law.** This volume is not a chemistry cheat sheet and not a compressed reference table. It is a fundamental doctrinal volume: chemistry is treated as a reper-packet theory of substances, reactions, conditions, sufficient foundations and special reductions of FOS.

**Boundary of claims.** Classical chemistry, atomic structure, the periodic system, valency, chemical bonding, pH, solubility, thermodynamics, kinetics, spectroscopy and analytical chemistry are not claimed as authorial discoveries. The authorial contribution consists in placing these layers into a single KLT/RBD normalization: substance, formula, reaction, ionic graph, material, solubility, pH, thermodynamics, kinetics, spectroscopy and analysis become a chain of verifiable Reper nodes.

## Abstract

Volume V introduces **Kurpishev Chemistry** as a reper-packet reduction of Fundamental Support Connectivity. A chemical world is not defined as a flat list of substances and not as a collection of reaction equations. It is a special domain

$$\mathcal{C}_K = \Theta_{chem}(FOS; D_{reaction}).$$

The minimal chemical unit is event@state:

$$C@C_{chem} = (e_{chem}, s_{chem}),$$

where  $e_{chem}$  is a chemical event - bond formation, bond breaking, electron transfer, protonation, precipitation, phase change, catalytic act or spectral registration - and  $s_{chem}$  is a state - composition, concentration, phase, temperature, pressure, pH, charge, solubility, material, medium and instrumental situation.

The chemical Reper has the form

$$Rep_{chem}(X) = (R_X, I_X, U_X; D_X),$$

where  $R_X$  is an established chemical fact,  $I_X$  is a formula, valency, charge, configuration or identifier,  $U_X$  is the field of possible compounds, reactions and conditions, and  $D_X$  is

the sufficient foundation: table, experiment, procedure, medium, source, mass-charge balance, thermodynamic or kinetic condition, or spectral confirmation.

The main thesis is

$$Truth_{chem}(X) \iff Dom_{chem}(X) \wedge D_X \wedge cr(U_X, I_X; R_X, D_X) = -1.$$

If the domain, medium, foundation, mass-charge balance, phase, pH, temperature, source or method is missing, the chemical node does not receive truth-status. It receives gap, candidate, hypothesis or needs-Evidence-D.

## Authorial constructions fixed in Volume V

1. Kurpishev Chemistry as a reduction of FOS.
2. Chemical object as  $C@C_{chem}$ .
3. Chemical Reper  $Rep_{chem}(X) = (R_X, I_X, U_X; D_X)$ .
4. Evidence-D as sufficient chemical foundation.
5. Reaction as Reper transition.
6. Ionic graph as the proof form of a reaction in solution.
7. Mass and charge balance as a minimal Dom/D admission condition.
8. Chemical CGI as an index of proof-chain hole density.
9. KLT-RBD-CHEM as a graph of substances, formulas, reactions, conditions, sources and statuses.
10. Special FOS reductions: DNA, biosystems, materials, culture and art.

## Source frame and prior-art boundary

The internal basis of Volume V is formed by Monograph 5.0, the Master2 editorial branch, the FOS journal article, PILOT-01, KLT-RBD-CHEM v0.1, the KLT-RBD-CHEM publication/site bundle v1.2, the restored chemistry branch of the website and the preceding volumes of the final monograph.

The classical chemical background is a table-reference corpus: atomic structure, the periodic system, chemical bonding, classes of substances, solubility, acidity, electrochemistry, organic classes, laboratory features and analytical reactions. This background is used as a source of domains and Evidence-D, but it is not merged with the authorial contribution.

The mathematical-logical base remains unchanged:

$$x \mapsto C@C_x \mapsto Rep_x(R, I, U; D) \mapsto \lambda_x \mapsto Status_x \mapsto RBD_x.$$

## Formal dictionary of notation

Symbol	Meaning
$C@C_{chem}$	chemical event@state

Symbol	Meaning
$e_{chem}$	chemical event
$s_{chem}$	chemical state
$Rep_{chem}$	chemical Reper quadruple
$R_X$	established chemical fact
$I_X$	formula, name, valency, charge, configuration, identifier
$U_X$	field of possible compounds, reactions, phases and conditions
$D_X$	sufficient chemical foundation
$D_{reaction}$	reaction foundation: medium, temperature, pH, catalyst, procedure
Evidence-D	documentary and experimental support of a chemical node
$\lambda_{chem}$	projective-harmonic coordination indicator of the Reper quadruple
$\delta_{truth}$	truth defect $ \lambda + 1 $
$CGI_{chem}$	chemical gap index
$RBD_{chem}$	database of chemical Reper nodes and links
$W_{chem}$	chemical world as a FOS reduction

## Part I. Chemistry as a Reper domain

### 1. Chemical object

#### 1.1 Substance as event@state

A classical substance is often described by a formula:  $H_2O$ ,  $NaCl$ ,  $CO_2$ ,  $Fe_2O_3$ . In the KLT/RBD frame the formula is not enough. The same formula may have different states: gas, liquid, solution, crystal, hydrate, ion form, complex, radical or intermediate product.

Therefore we introduce

$$Substance_X = C@C_{chem}(X) = (e_X, s_X).$$

The event  $e_X$  fixes the act of appearance or registration of the substance. The state  $s_X$  fixes phase, medium, concentration, temperature, pressure, pH, charge and observation procedure.

**Definition 1.1.** A chemical object is a pair

$$X_{chem} = (e_X, s_X),$$

where  $e_X$  is a chemical event and  $s_X$  is a chemical state. The object is admissible only if  $Dom_{chem}(X)$  is specified.

**Example 1.2.** The notation  $HCl$  without state is an incomplete chemical flag. In the gas phase it denotes hydrogen chloride. In water it denotes hydrochloric acid with ionization into  $H_3O^+$  and  $Cl^-$ . Hence

$$HCl(g) \neq HCl(aq),$$

and the two nodes receive different  $C@C_{chem}$  records, different Evidence-D and different RBD links.

## 1.2 Formula as invariant but not as complete object

The formula enters the component  $I_X$ :

$$I_X = \text{formula/name/charge/configuration}.$$

But a chemical fact is not exhausted by a formula. A formula without state is an invariant label, not a Reper node. Truth-status requires

$$(R_X, I_X, U_X; D_X).$$

**Proposition 1.3.** A chemical formula is a necessary but insufficient part of a chemical Reper.

## 2. Chemical Reper

### 2.1 Definition

**Definition 2.1.** The chemical Reper of an object  $X$  is the quadruple

$$Rep_{chem}(X) = (R_X, I_X, U_X; D_X).$$

Its components are

$$R_X = \text{established substance, reaction, measurement or property,}$$

$$I_X = \text{formula, name, valency, charge, configuration, index,}$$

$$U_X = \text{field of possible compounds, reactions, phases, pH and media,}$$

$$D_X = \text{table, experiment, balance, procedure, source, instrument, medium.}$$

## 2.2 The fourth point Evidence-D

The component  $D_X$  is not externally appended to chemistry. It is the fourth point without which the triple  $R_X, I_X, U_X$  remains incomplete.

In chemistry this is critical. A reactional conclusion cannot be assigned truth-status if it does not state:

- the medium of the reaction;
- the phase of substances;
- whether mass and charge are balanced;
- whether a catalyst is present;
- whether temperature and pressure are admissible;
- how the product is confirmed;
- whether there is spectral, tabular or laboratory support.

Thus

$$(R_X, I_X, U_X) \not\Rightarrow Truth_{chem}(X).$$

Only

$$(R_X, I_X, U_X; D_X) \wedge Dom_{chem}(X) \Rightarrow \text{admission to } \lambda\text{-verification.}$$

## 3. Chemical truth

### 3.1 Lambda closure

For a chemical Reper the projective-harmonic indicator is written

$$\lambda_{chem}(X) = \frac{(U_X - R_X)(I_X - D_X)}{(U_X - D_X)(I_X - R_X)}.$$

The truth defect is

$$\delta_{truth}^{chem}(X) = |\lambda_{chem}(X) + 1|.$$

**Definition 3.1.** A chemical node has truth-status only when

$$Dom_{chem}(X) \wedge D_X \wedge \lambda_{chem}(X) = -1.$$

The formula is not a numeric fetish. It is a structural requirement: reality, invariant, universe of possibilities and sufficient foundation must form a harmonic Reper configuration.

### 3.2 Statues

Status	Meaning
truth-status	domain, foundation, balance and harmonic closure are present
gap-domain	the chemical domain is missing or ambiguous
gap-foundation	sufficient foundation is missing
needs-balance	mass or charge is not balanced
needs-medium	medium, phase, pH or temperature is unspecified
candidate	formula or reaction is plausible but not authorized
hypothesis	the node is an open chemical conjecture
needs-Evidence-D	documentation or experiment is required

## Part II. Substance, reaction and ionic graph

### 4. Substance node

A substance node in KLT-RBD-CHEM is not only a name. It is a record

$$Node_{sub}(X) = (id_X, formula_X, name_X, phase_X, charge_X, medium_X, D_X, Status_X).$$

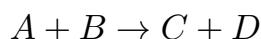
The same formula may give several nodes:

Formula	Node	Difference
$H_2O$	liquid water	phase and standard conditions
$H_2O$	ice	solid phase and lattice state
$H_2O$	vapor	gas phase and temperature-pressure domain
$H_2O$	solvent node	medium and solvation role
$H_2O$	product node	reaction output with evidence

**Definition 4.1.** A substance node is complete when formula, state, domain and sufficient foundation are present.

### 5. Reaction as Reper transition

A classical reaction equation



is insufficient in the KLT/RBD frame. A reaction must be treated as a transition of Reper states:



$$Rep_{chem}(A, B; s_0) \xrightarrow{\Delta, \Xi, \Upsilon; D_{reaction}} Rep_{chem}(C, D; s_1).$$

The operator  $\Delta$  fixes the initiating act: contact, heating, irradiation, mixing, catalyst insertion, voltage or pressure. The operator  $\Xi$  fixes the process: bond rearrangement, electron transfer, diffusion, nucleation, phase shift. The operator  $\Upsilon$  fixes the product-state turn: precipitation, gas release, complex formation, color change, spectral peak or stabilized material.

**Definition 5.1.** A reaction is a Reper transition if it contains initial state, process state, product state and sufficient reaction foundation.

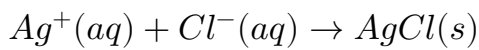
## 5.1 Balance admission

The minimal admission test is

$$Balance_{mass}(r) = 1 \wedge Balance_{charge}(r) = 1.$$

If either condition is absent, the reaction does not enter truth-verification. It receives needs-balance.

**Example 5.2.** The ionic equation



is admissible only with medium, ionic species, precipitate state and source/procedure of recognition. The equation is not merely symbolic; it is a Reper transition from solution-state ions to a solid precipitate node.

## 6. Ionic graph

For solution chemistry the natural proof object is not only a formula but an ionic graph:

$$G_{ion} = (V_{ion}, E_{trans}, D_{medium}).$$

Here  $V_{ion}$  is the set of ionic nodes,  $E_{trans}$  is the set of transfer, precipitation, protonation, complexation and redox edges, and  $D_{medium}$  is the medium foundation.

**Definition 6.1.** An ionic graph is admissible if every edge has medium, charge, phase and Evidence-D.

The ionic graph prevents a common error: a formula equation may look balanced but may be chemically false in the given medium. KLT-RBD-CHEM therefore checks the graph, not only the string.

## 7. pH, solubility and phase gates

### 7.1 pH gate

Many chemical statements are true only in a pH domain. We write

$$Dom_{pH}(X) = [pH_{min}, pH_{max}].$$

A node without  $Dom_{pH}$  is incomplete when acidity or alkalinity controls the result.

**Proposition 7.1.** If a reaction depends on protonation, hydrolysis, precipitation or acid-base equilibrium, then pH is part of  $D_{reaction}$ .

### 7.2 Solubility gate

Solubility is an admission condition for solution reactions. Let

$$Sol(X; T, pH, medium) \in \{soluble, slightly\ soluble, insoluble, conditional\}.$$

If solubility is unknown, the product-state cannot be fixed.

### 7.3 Phase gate

The phase gate is written

$$Phase(X) \in \{s, l, g, aq, crystal, amorphous, complex, intermediate\}.$$

A chemical equation without phase information is a formula-chain candidate, not yet a verified Reper transition.

## 8. Thermodynamics and kinetics

Thermodynamics and kinetics are not interchangeable. Thermodynamics answers whether a transition is energetically admissible. Kinetics answers whether and how fast it occurs in the stated domain.

Thus a reaction node must distinguish

$$D_{therm} = \{\Delta G, \Delta H, \Delta S, K, T, p\},$$

from

$$D_{kin} = \{rate, mechanism, activation, order, catalyst, medium\}.$$

**Principle 8.1.** A thermodynamic possibility does not imply kinetic realization. A kinetic observation does not by itself identify the complete thermodynamic Reper.

This principle blocks the replacement of proof by plausibility. If a reaction is only favorable but no mechanism or evidence is known, its status remains conditional.

## 9. Spectroscopy and analytical chemistry

Spectral and analytical evidence form a privileged subclass of Evidence-D:

$$D_{spectral} = \{IR, UV, MS, NMR, Raman, XRD, chromatography, colorimetric, qualitative tests\}$$

**Definition 9.1.** A spectral Reper is a quadruple

$$Rep_{spec}(X) = (Signal_X, Assignment_X, Alt_X; D_{instrument}).$$

Here  $Signal_X$  is the observed signal,  $Assignment_X$  is the proposed chemical assignment,  $Alt_X$  is the universe of alternative assignments, and  $D_{instrument}$  is the instrument/procedure foundation.

**Theorem 9.2.** A spectral signal alone does not authorize a chemical identity unless the alternative assignments and instrumental domain are stated.

**Proof.** The signal is the  $R$  component. The assignment is the  $I$  component. Alternative assignments form  $U$ . The instrumental protocol and reference library form  $D$ . Without  $U$  and  $D$ , the Reper is incomplete. Therefore truth-status is unavailable.  $\square$

## Part III. KLT-RBD-CHEM

### 10. Database schema

KLT-RBD-CHEM is the graph form of Volume V. Its minimal schema is

$$RBD_{chem} = (Substances, Reactions, Conditions, Evidence, Statutes, Edges).$$

A substance table stores formula, names, state, charge, phase, hazard domain, source and status. A reaction table stores reactants, products, coefficients, conditions, medium, balance checks, evidence and status. The edge layer links substances to reactions, reactions to evidence, evidence to sources and statuses to audit rules.

#### 10.1 Minimal tables

Table	Function
chem_substance	formula, state, phase, charge, identifiers
chem_reaction	reactants, products, coefficients, conditions
chem_condition	pH, T, pressure, solvent, catalyst, medium
chem_evidence	tables, experiments, spectra, methods, sources
chem_edge	typed graph links
chem_status	truth, gap, candidate, hypothesis, needs-D

## 11. Chemical CGI

The chemical gap index measures the hole-density of a chemical chain:

$$CGI_{chem}(r) = \frac{h_{Dom} + h_D + h_{balance} + h_{medium} + h_{phase} + h_{source}}{n_{claims} + \epsilon}.$$

Here the numerator records missing domain, missing foundation, missing balance, missing medium, missing phase and missing source. The denominator normalizes by the number of chemical claims.

**Definition 11.1.** A chain is chemically stable if

$$CGI_{chem}(r) < 1$$

and every critical node has Evidence-D. A chain with  $CGI_{chem} \geq 1$  requires repair before publication or database ingestion.

## 12. Import and audit route

Every chemical text, table or laboratory note is imported by the route

$$Text \rightarrow Extract \rightarrow Normalize \rightarrow C@C_{chem} \rightarrow Rep_{chem} \rightarrow Audit \rightarrow RBD_{chem}.$$

The audit stage performs the following checks:

1. domain check;
2. sufficient foundation check;
3. formula normalization;
4. mass balance;
5. charge balance;
6. phase/medium check;
7. pH and solubility gate;
8. evidence and source check;
9. lambda-harmonic consistency;
10. status assignment.

## Part IV. Special FOS reductions

### 13. DNA as chemical-informational Reper

DNA is not reduced to a mere chemical formula and not detached from chemistry as pure information. In the KLT/RBD frame it is a chemical-informational Reper:

$$Rep_{DNA} = (R_{mol}, I_{seq}, U_{bio}; D_{lab}).$$

Here  $R_{mol}$  is the molecular realization,  $I_{seq}$  is the sequence/invariant,  $U_{bio}$  is the field of possible biological expressions and mutations, and  $D_{lab}$  is laboratory and sequencing evidence.

**Proposition 13.1.** DNA is a special FOS reduction because it simultaneously holds material bonding, sequence invariance, biological possibility and evidence foundation.

## 14. Biosystems

A biosystem is a layered chemical Reper:

$$BioSys = (Chem, Cell, Organism, Environment; D_{bio}).$$

The chemical layer alone does not define the organism, but no biological statement is evidence-stable without chemical carriers, conditions and measurement domain.

KLT-RBD-CHEM therefore treats metabolism, enzymatic catalysis, membrane transport and signaling as Reper transitions with chemical, biological and environmental conditions.

## 15. Materials and technology

A material is not only composition. It is a stateful chemical object:

$$Material_X = (Composition_X, Structure_X, Process_X, Use_X; D_X).$$

The same composition can produce different materials under different synthesis, thermal, mechanical and surface conditions. Therefore a material node requires process Evidence-D.

**Example 15.1.** Iron oxide can be an analytical precipitate, a pigment, a corrosion product or a structural phase. The formula alone does not decide the Reper.

## 16. Culture and art

Chemical Evidence-D enters culture and art through pigments, binders, corrosion, restoration, dating, conservation and material analysis. But a cultural object is not reduced to chemical composition.

We write

$$Rep_{art} = (R_{object}, I_{form}, U_{interpret}; D_{material} + D_{cultural}).$$

The chemical layer supplies  $D_{material}$ . The cultural layer supplies  $D_{cultural}$ . The two foundations must not be confused.

## Part V. Theorems and proof protocol

### 17. Central theorem of chemical reduction

**Theorem 17.1.** Let  $FOS$  be Fundamental Support Connectivity, let  $\Theta_{chem}$  be an admissible chemical reducing functor, and let  $D_{reaction}$  be a sufficient foundation of the chemical domain. Then the chemical world

$$W_{chem} = \Theta_{chem}(FOS; D_{reaction})$$

is a Reper-realized chemical world if and only if for every chemical object  $X \in W_{chem}$  there exist

$$C@C_{chem}(X), \quad Rep_{chem}(X) = (R_X, I_X, U_X; D_X),$$

and

$$Dom_{chem}(X) \wedge D_X \wedge cr(U_X, I_X; R_X, D_X) = -1.$$

**Proof.** Necessity follows because a chemical object without event@state is only a name or a formula, not a realized object. The Reper quadruple adds real content, invariant, field of possibilities and sufficient foundation. Without  $D_X$  a chemical chain cannot distinguish an admissible product from a formal symbol. Sufficiency follows because  $C@C_{chem}$ ,  $Rep_{chem}$ , domain and harmonic closure give the object local fixation, possible transitions and verifiable status. Therefore  $\Theta_{chem}$  produces not a random list of substances, but a compatible system of chemical Reper assemblies.  $\square$

### 18. Chemical gap theorem

**Theorem 18.1.** Any chemical formula-chain in which at least one component is absent -  $Dom_{chem}$ ,  $D_{reaction}$ , mass balance, charge balance or Evidence-D - does not receive truth-status and is assigned gap-status.

**Proof.** A chemical formula-chain is a special case of general formula-chain audit. General audit requires a domain and sufficient foundation. In chemistry the domain is realized through medium, phase, temperature, pH, charge, mass, source and procedure. The absence of any mandatory component makes the chain underdetermined.  $\square$

### 19. Reaction as Reper-transition theorem

**Theorem 19.1.** A reaction  $A + B \rightarrow C + D$  is not a simple arrow between formulas but a Reper transition between states if and only if the operator triple

$$\Delta_{reaction}, \quad \Xi_{process}, \quad \Upsilon_{product}$$

and the sufficient foundation of the transition are specified.

**Proof.** A reaction has beginning, process and product-state. The beginning is fixed by  $\Delta_{reaction}$ . The change of composition and bonds is fixed by  $\Xi_{process}$ . Translation into a new product state is fixed by  $\Upsilon_{product}$ . Without one of these components the reaction either does not start, does not have a process, or does not fix the product-state.  $\square$

## 20. Proof protocol of Volume V

Every chemical statement in Volume V must follow the route

$$Claim_{chem} \rightarrow Dom? \rightarrow D? \rightarrow Balance? \rightarrow Evidence? \rightarrow \lambda? \rightarrow Status.$$

If the route is not completed, the statement remains in one of the working statuses: gap, candidate, hypothesis, needs-source, needs-balance, needs-lab-D.

## Appendix A. Insertion map for the final monograph

insert_id	Place	Title	Status
V-CH-01	Volume V, Part I	Chemistry as Reper domain	ready
V-CH-02	Volume V, Part II	Substance and reaction	ready
V-CH-03	Volume V, Part III	KLT-RBD-CHEM and Evidence-D	ready
V-CH-04	Volume V, Part IV	DNA, biosystems, materials	ready
V-CH-05	Volume V, appendix	Tables and proof-status	ready

## Appendix B. Formula index

Formula	Function
$\mathcal{C}_K = \Theta_{chem}(FOS; D_{reaction})$	chemistry as FOS reduction
$C@C_{chem} = (e_{chem}, s_{chem})$	minimal chemical unit
$Rep_{chem}(X) = (R_X, I_X, U_X; D_X)$	chemical Reper
$Truth_{chem} \iff Dom \wedge D \wedge cr = -1$	truth-status
$G_{ion} = (V_{ion}, E_{trans}, D_{medium})$	ionic graph
$CGI_{chem}$	chemical gap index
$Rep_{DNA}$	DNA as chemical-informational Reper

## Appendix C. Index of authorial concepts

- Kurpishev Chemistry.
- $C@C_{chem}$ .
- $Rep_{chem}$ .
- Evidence-D.
- Chemical CGI.
- Ionic Reper graph.

- Reaction as Reper transition.
- Chemical gap audit.
- KLT-RBD-CHEM.
- Special FOS reductions.

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## Conclusion

Volume V fixes Kurpishev Chemistry as an autonomous layer of the Doctrine. Its central result is the transfer of chemistry from the mode of lists of substances and reactions into the mode of a proof-connected Reper graph. In this frame a substance receives event@state, a formula enters the invariant component, a reaction becomes a Reper transition, Evidence-D becomes the fourth point of sufficient foundation, and truth-status is assigned only after verification of domain, foundation, balance, source and harmonic closure.

Next control point:

KLT-DOCTRINE-FINAL-MONOGRAPH-VOLUME-VI-KLT-RBD-SOFTWARE-LEGAL-RU-v8.1.