The Rossi number as a physic-chemical "resultant" of chemical and rheological properties of liquid/fluid systems

Davide Rossi and Nicola Realdon

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AVOGADRO number and the Mole

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Concentration term

Molarity (1m)xVol. (1L)

N_A molecules

Particle form

1 mole

Mass form

1 gm formula (substance)

1 gm molecules

N_A atoms

Volume at STP form

1 gm atom (element)

22.4 L

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Mass, Moles, Molar Mass and AVOGADRO number

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N_A molecules

Particle form

AVOGADRO NUMBER
$N_A = 6{,}022 * 10^{23}$

N_A atoms

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Molar mass (M)

Moles of element (n=m/M)

Mass of element (m=[N/N_A]*M)

Atoms of element (N=n*N_A)

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26th CGPM Conference 2019 and Avogadro number

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AVOGADRO NUMBER
$N_A = 6{,}022 * 10^{23}$

Exact definition N_A

2019 AVOGADRO NUMBER
$N_A = 6{,}022\mathbf{14076} * 10^{23}$
ELEMENTARY ENTITIES

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Redefinition of moles concept (from n to *N*)

Moles of **element** (n=m/M)

Moles of **particles** (*N* particles/**substance**)

Experimentally **determinable**

Molar mass (M) **substance**

n times $\overline{M}$ (average) of 1 **particle/substance**

Mole → SI unit → AMOUNT OF SUBSTANCE

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From Avogadro number to structure of a material

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2019 AVOGADRO NUMBER
$N_A = 6{,}022\mathbf{14076} * 10^{23}$

ELEMENTARY ENTITIES

Atoms | **Molecules** | **Ion** | **Electron** | **Particles**

Group particles

Interrelated elements

Particle A | **Particle C**

Particle B | **Particle n**

STRUCTURE MATERIAL

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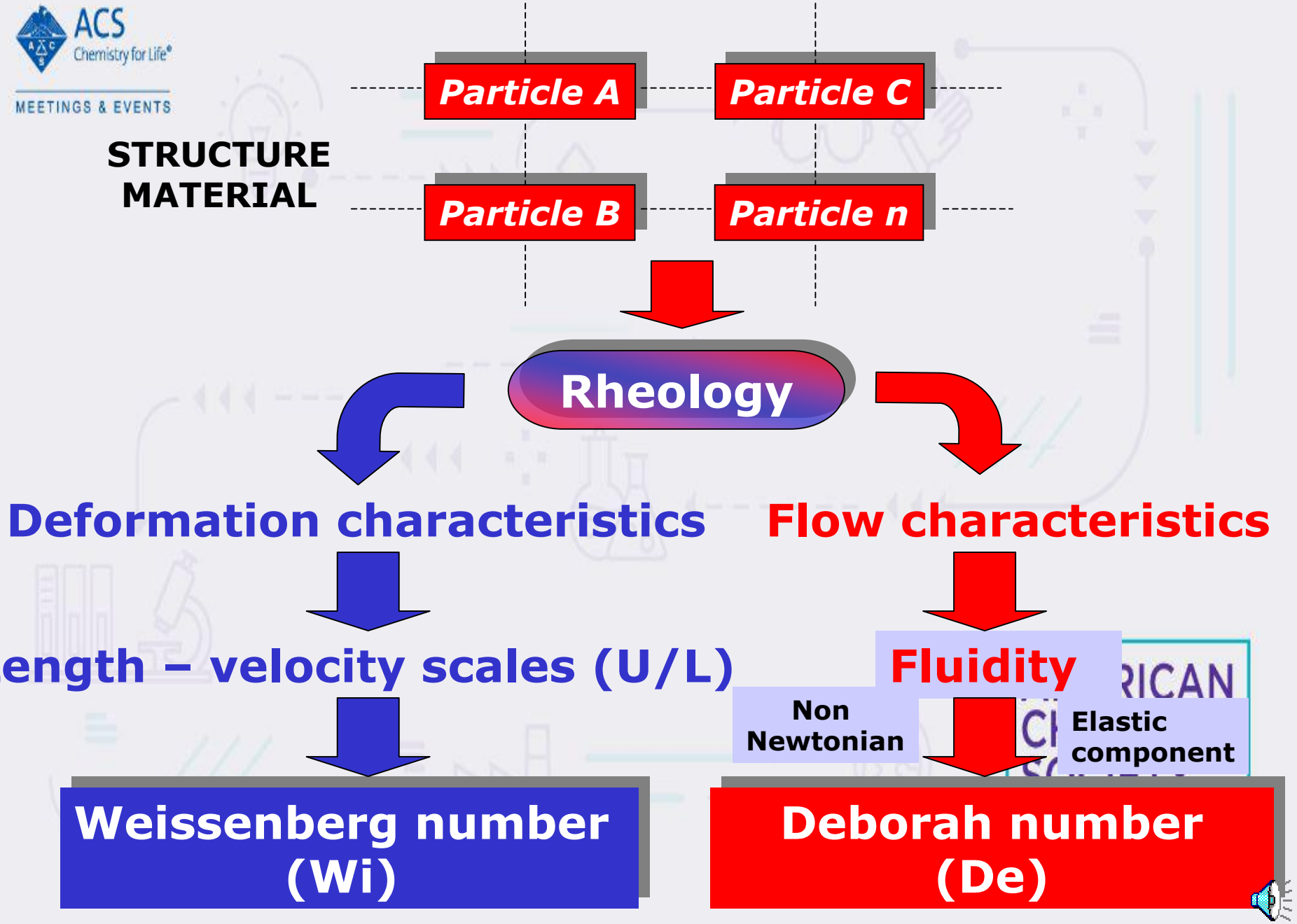
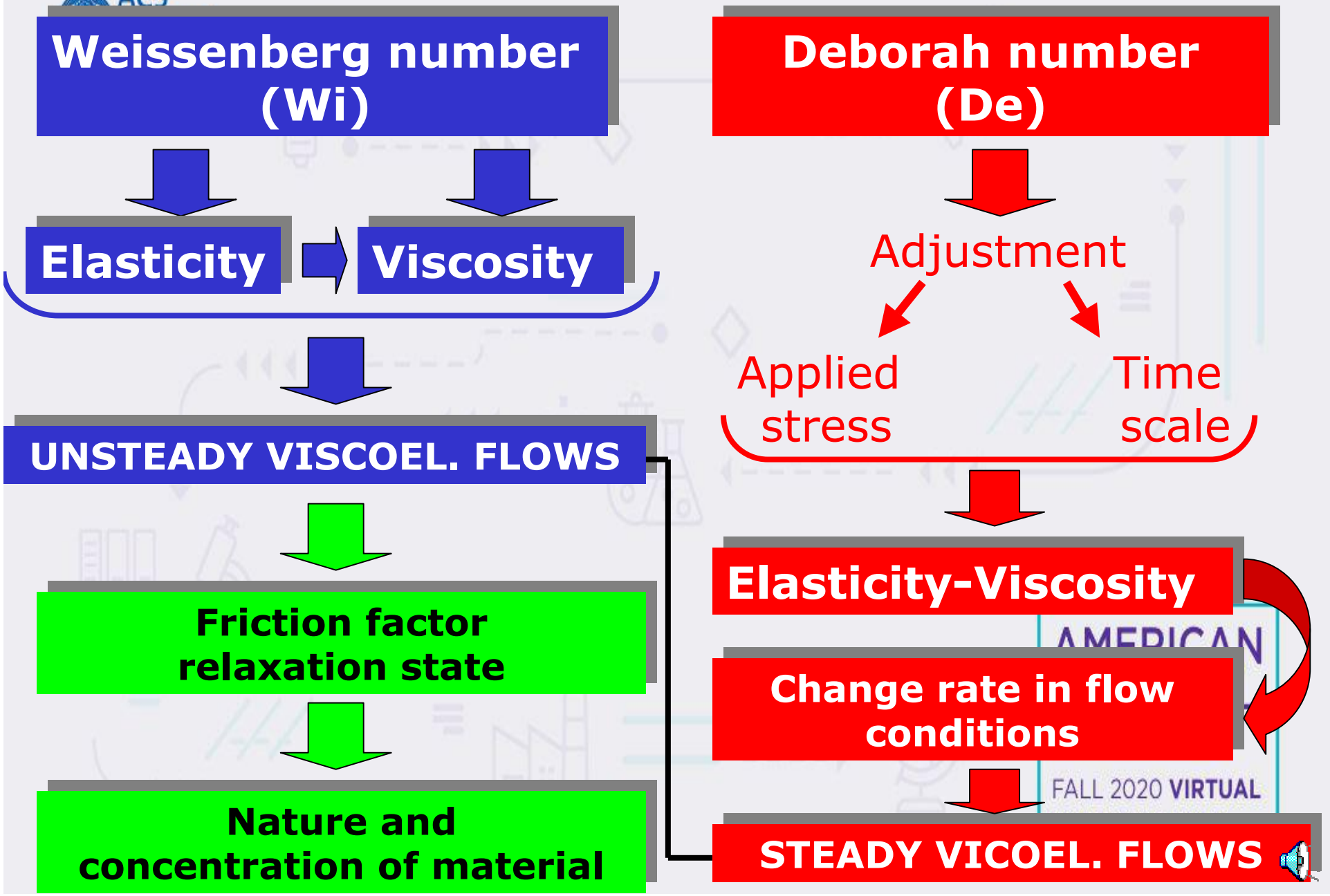
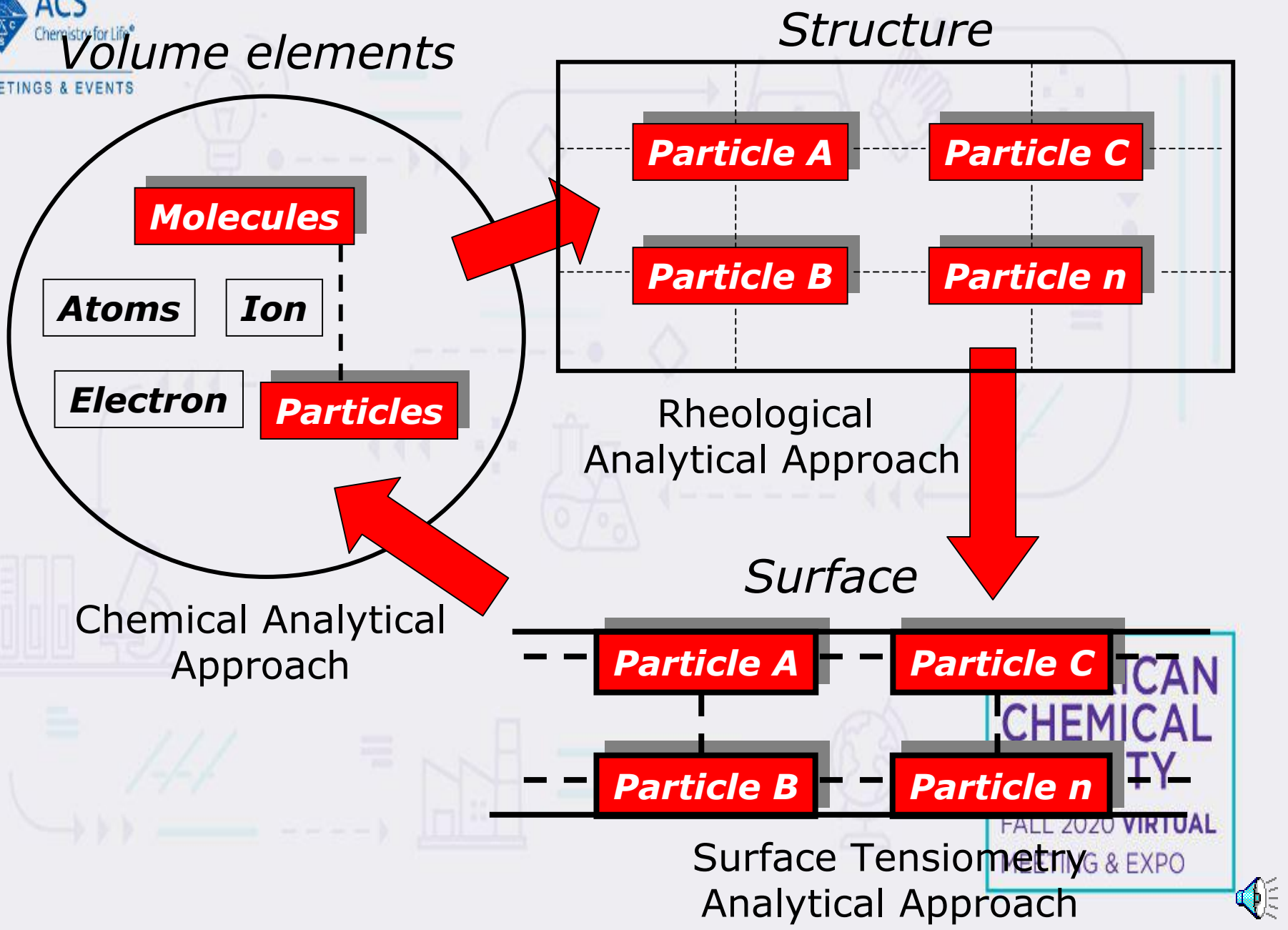
From Avogadro number to Deborah/Weissenberg numbers



The Deborah and Weissenberg numbers



The Integrated Analytical Approach (IAA)



From Weissenberg number to Rossi number

Structure

Weissenberg number (Wi)

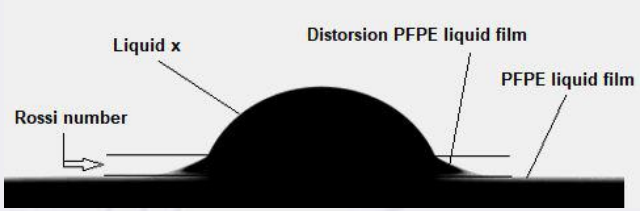
Friction factor relaxation state

INFLUENCE ON MATERIAL CHARACTERIZATION

Deformation material (material depending)

Surface

Rossi number (Rn)



Deformation Liquid film PFPE (material depending)

No friction factor
No roughness

PURE DATA
NO INFLUENCE ON MATERIAL CHARACTERIZATION

Rossi number and Solid-like Methodology (SLM)

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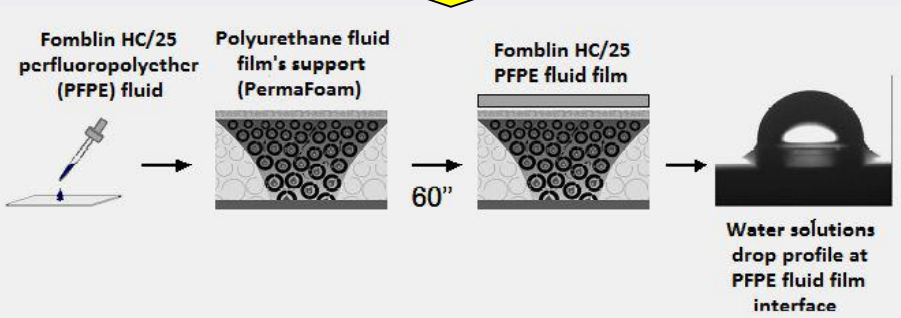
Rossi number (Rn)



Solid-like Methodology (SLM)

FOMBLIN HC25®PFPE

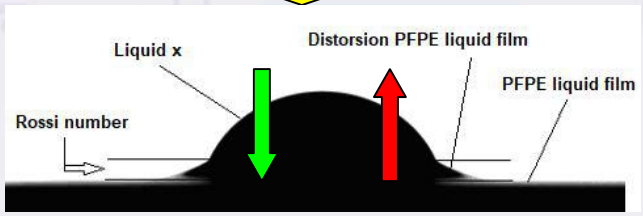
Hydrophobic

Lipophobic

Self-repellent

Interfacial PFPE/liquid repulsion forces

Gravity force



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Rossi number and Avogadro number

2019 AVOGADRO NUMBER
$N_A = 6{,}022\mathbf{14076} * 10^{23}$

Molar mass (M) **substance**

AMOUNT OF SUBSTANCE

Elementary entities

Chemical-Surface correlation

Rossi number (Rn)

Interfacial PFPE/liquid repulsion forces

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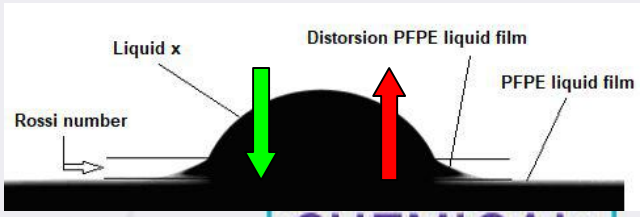

Influence on PFPE liquid film/liquid contact angle

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Rossi number: chemical-surface correlations

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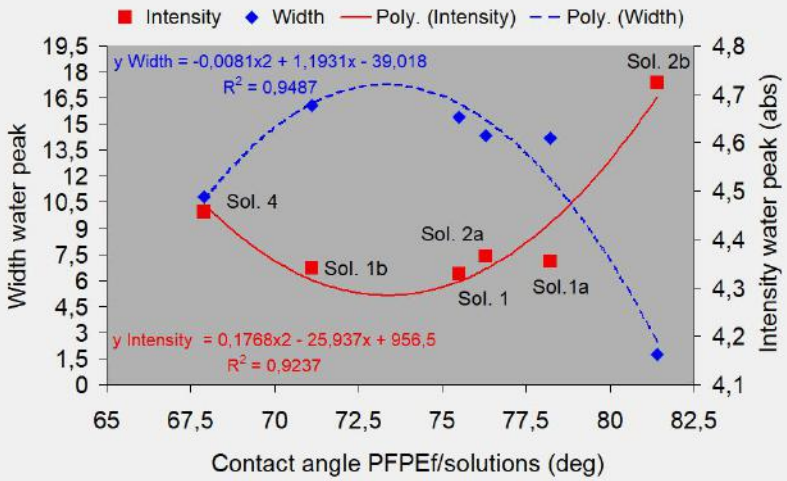
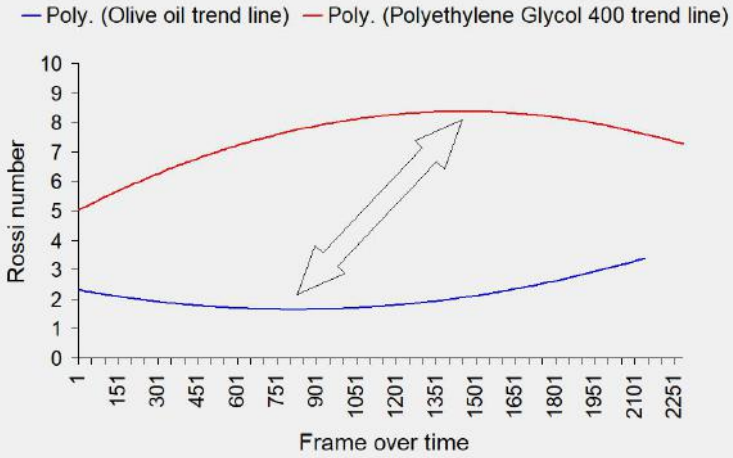
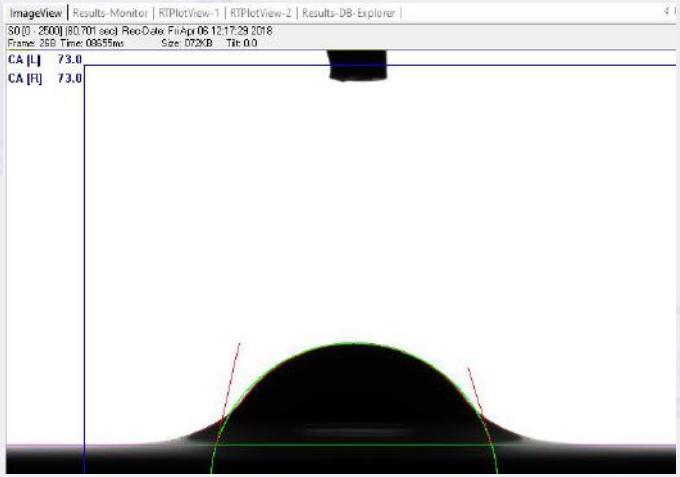
Rossi number (Rn)



Chemical-Surface correlation

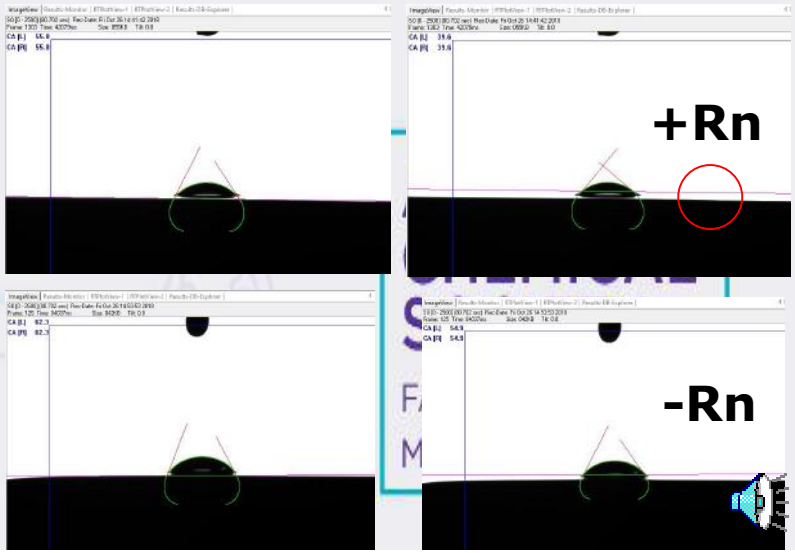


Rossi number over time

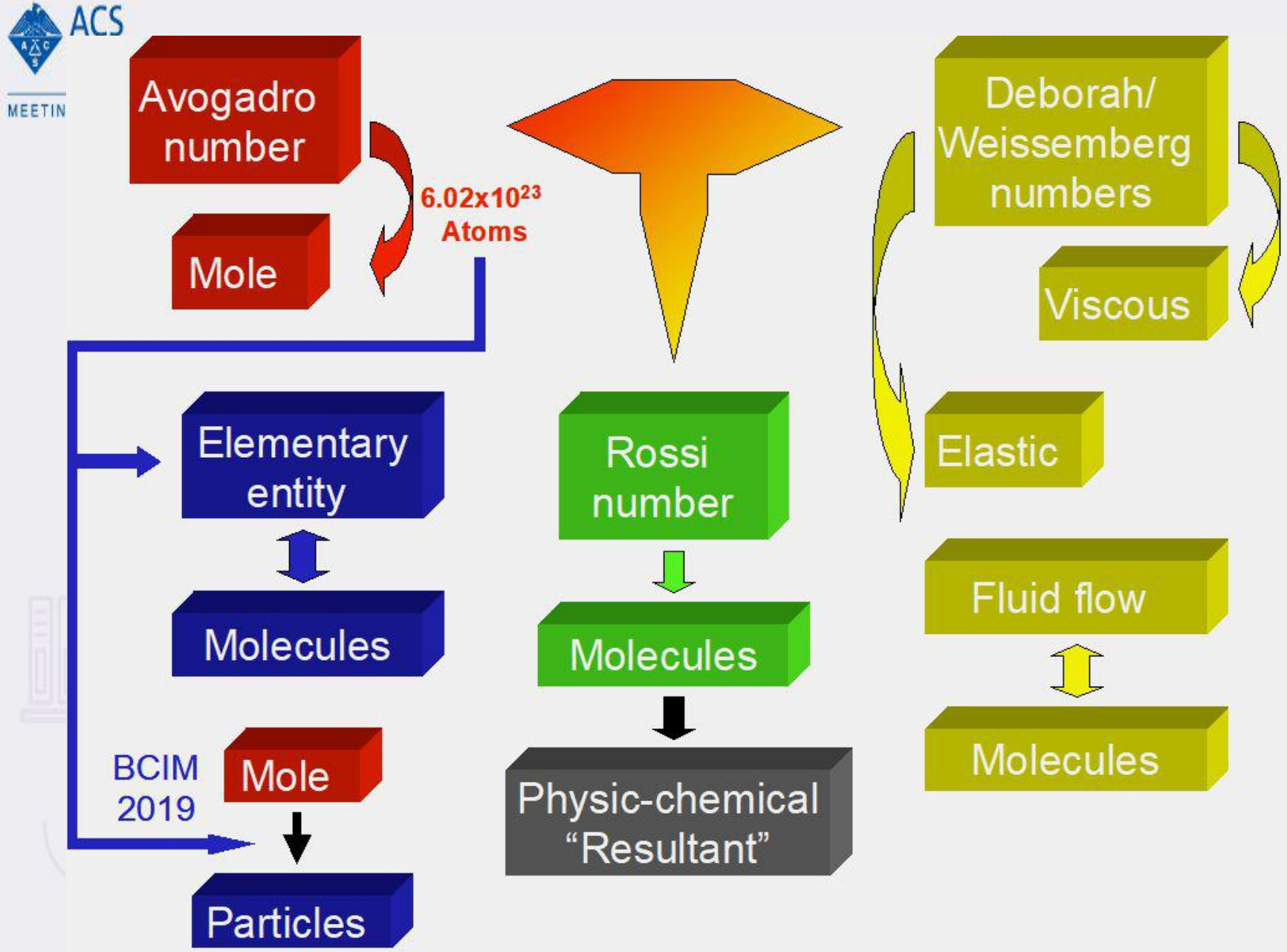


PEG

OIL



Rossi number: a physic-chemical “resultant”



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