Unifying Concepts for Acid-Base- and Redox-Chemistry: Development, Validation and Application of Absolute pH and pe Scales Culminating in the Protoelectric Potential Map PPM

Fact Sheet

Project Information

UniChem
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Closed project
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Hosted by
ALBERT-LUDWIGS-UNIVERSITAET FREIBURG Germany

Objective

Acid-base and redox chemistry are the two most fundamental concepts in general chemistry. However, both concepts are usually limited to one medium/solvent, although they are related through the gaseous hydrogen atom delivering the proton for Brønsted acidity and the electron for redox chemistry. Here we describe, how the ideal proton gas and the ideal electron gas form the reference states for our absolute pH Brønsted acidity scale (Angew. Chem. 2010) and the related absolute pe redox scale. Both can be combined to the Protoelectric Potential Map (PPM) that allows studying and understanding any redox or acid base reaction over solvent and even phase boundaries in dependence of the pHabs and peabs. First examples for this PPM are included with the proposal and ways how to...
peaks. First examples for this PPM are included with the proposal and ways how to establish anchor points for this two-dimensional PPM scale are delineated. It should be noted that this unifying concept is thermodynamically exact and makes full use of all hitherto available (experimental or calculated) pKa-values, Gibbs transfer energies and electrochemical standard potentials in either aqueous or non-aqueous solution. Even coupling to the gaseous or solid state is possible.

The research team shall include three subgroups: i) the principle problem conception and method development Methodology Group (MG), ii) the experimental validation and measurement Validation Group (VG) and last, but not least, iii) the preparative chemistry group that shall make use of the inherent potential of this unified view on Brønsted acidity and redox chemistry by preparing unusual protonated or oxidized species that present spectacular prototype problems to elucidate the frontiers of chemistry (Application Group AG).

By using this threefold approach, we envision to highlight the full potential of this new concept to those who could also make use of this approach, i.e. scientists from almost all areas of chemistry and the surrounding disciplines.

Field of science

/ engineering and technology/environmental engineering/energy and fuels/fossil energy/gas

Programme(s)

Topic(s)

Call for proposal

ERC-2011-ADG_20110209

Funding Scheme

ERC-AG - ERC Advanced Grant

Host institution

ALBERT-LUDWIGS-UNIVERSITAET FREIBURG

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Activity type
Higher or Secondary Education Establishments

EU contribution
€ 1 866 000
Beneficiaries (1)

ALBERT-LUDWIGS-UNIVERSITAET FREIBURG

Germany

EU contribution

€ 1 866 000

Address

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Activity type

Higher or Secondary Education Establishments

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