

cally acceptable drug salts, training and research in medicinal chemistry in developing countries, and the glossary of terms used in medicinal chemistry, as well as other topics.

“Pharmaceutics” is defined in this glossary as the science of the preparation of drugs, dosage forms, and drug delivery systems, taking into account the pharmacokinetics and pharmacodynamics of the drug as well as its physical and chemical properties. Thus, many branches of chemistry, such as organic, inorganic, solid state, colloid, and surface chemistry, as well as nanotechnology and others, play roles in pharmaceutics. Even the more biologically oriented branch of pharmaceutics—i.e., biopharmaceutics—draws on chemical concepts, such as (pharmaco)kinetics, absorption, dissolution, diffusion, and others. Therefore, it is timely for IUPAC to publish recommendations in this area.

The field of pharmaceutics itself is of a multidisciplinary nature, as its practitioners come from a variety of disciplines, such as chemistry or various biological sciences; thus, a glossary containing authoritative definitions would be useful for them. The terms used in pharmaceutics are rarely covered by existing glossaries; the few glossaries that do include them provide definitions that are often inappropriate for the field of pharmaceutics and require new or modified definitions to better fit the new context.

This glossary of terms related to pharmaceutics is needed by practitioners in the field, because it fulfills an important and crucial role that is different from the roles of other scientific disciplines involved in the drug-making process. The glossary contains 168 definitions used in pharmaceutics. These terms are related to various aspects of this discipline, such as (1) physicochemical characterization of pharmaceutical preparations and the active ingredients they contain, (2) unit operations used in the practice of pharmaceutics, (3) terms related to the various dosage forms, (4) terms related to the various modes and routes of drug delivery, (5) terms used in pharmacokinetics and biopharmaceutics in general, and (6) additional miscellaneous terms.

Considerable effort was made to make all the terms in the glossary compatible with similar terms (where they exist) in the online IUPAC Gold Book. Readers are invited to point out any errors or inconsistencies to the authors.

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Reference Matrices: An Essential Tool for Testing Extrinsic Substance Properties

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Within a substance-oriented concept in environmental testing (e.g., the European legislation on chemical—REACH—or pesticide and biocide registration) or a preventive approach to environmental protection, the occurrence, fate, and exposure processes and the adverse effects imposed by toxicants have to be elucidated and assessed. This means having to consider processes that depend on the properties of the substance, the properties of the environmental compartments, and the habitat and sensitivity of the organisms tested. To derive tolerable concentrations of substances (pollutants) in environmental compartments (e.g., soils or sediments), it is necessary to measure both intrinsic properties and extrinsic response functions.

The concept of reference matrices does not deal with the “static” physical and chemical properties of a matrix but with dynamic functions (e.g., transformation, sorption or desorption, transport and effects on fauna and flora). It is important to mention that reference matrices are designed for laboratory testing. This means matrices are sampled in a specific environmental compartment, treated, stored, and characterized. By this, the original sample becomes a specific lot of a reference entity (e.g., a true soil). The idea behind the reference system is to reduce the complexity of the natural environment to a level where it becomes controllable from an experimental point of view without losing the ability to commute the results obtained back to the reality of the original environment.

The concept supports standardization in measurement and testing of chemicals in the environmental or in biological systems, thus leading to:

- comparability of experimental data
- traceability to the common reference point, thus introducing the notion of quality control over measurement and testing
- the ability to extrapolate laboratory findings to the “real world” or the natural environment by using models

The concepts and the philosophy of reference matrices were developed within the IUPAC project on reference soils, and their feasibility was proven using this example. Well-defined reference matrices offer

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interesting perspectives for increasing environmental realism in chemical risk assessment. The legislation and regulation of various groups of biologically active substances, such as pesticides, biocides, and pharmaceuticals, and the new chemical regulation (REACH) emphasizes the need to have available well-defined reference matrices. This need parallels the need to test environmental fate and effects and new materials (e.g., artificially produced nanomaterials).

The concept that we outline provides suitable guidelines for selecting reference matrices. However, we note that agreement on optimal application of reference matrices and interpretation of results obtained in tests using reference matrices needs to be reached between scientists, risk assessors, reference laboratories, and international standard organizations.

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 www.iupac.org/web/ins/2001-026-1-600

Comprehensive Inter-Laboratory Calibration of Reference Materials for $\delta^{18}\text{O}$ Versus VSMOW Using Various On-Line High-Temperature Conversion Techniques

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Internationally distributed organic and inorganic oxygen isotopic reference materials have been calibrated by six laboratories carrying out more than 5 300 measurements using a variety of high-temperature conversion techniques (HTC) in an evaluation sponsored by IUPAC. To aid in the calibration of these reference materials, which span more than 125 per mille, an artificially enriched reference water ($\delta^{18}\text{O}$ of +78.91 per mille) and two barium sulfates (one depleted and one enriched in ^{18}O) were prepared and calibrated relative to VSMOW2* and SLAP reference waters. These materials were used to calibrate the other isotopic reference materials in this study, which yielded:

Isotopic reference material	$10^3 \delta(^{18}\text{O}_{\text{VSMOW-SLAP}})$ reference value
IAEA-602 benzoic acid	+71.28
USGS35 sodium nitrate	+56.81
IAEA-NO-3 potassium nitrate	+25.32
IAEA-601 benzoic acid	+23.14
IAEA-SO-5 barium sulfate	+12.13
NBS 127 barium sulfate	+8.59
VSMOW water	0
IAEA-600 caffeine	-3.48
IAEA-SO-6 barium sulfate	-11.35
USGS34 potassium nitrate	-27.78
SLAP water	-55.5

A primary conclusion of this study is that nitrate samples analyzed for $\delta(^{18}\text{O})$ should be analyzed with internationally distributed isotopic nitrates, and likewise for sulfates and organics. Authors reporting relative differences of oxygen-isotope ratios [$\delta(^{18}\text{O})$] of nitrates, sulfates, or organic material should explicitly state in their reports the $\delta(^{18}\text{O})$ values of two or more internationally distributed nitrates (USGS34, IAEA-NO-3, and USGS35), sulfates (IAEA-SO-5, IAEA-SO-6, and NBS 127), or organic material (IAEA-601 benzoic acid, IAEA-602 benzoic acid, and IAEA-600 caffeine), as appropriate to the material being analyzed, had these reference materials been analyzed with unknowns. This procedure ensures that readers will be able to normalize the $\delta(^{18}\text{O})$ values at a later time should it become necessary. The high-temperature reduction technique for analyzing $\delta(^{18}\text{O})$ and $\delta(^2\text{H})$ is not as widely applicable as the well-established combustion technique for carbon and nitrogen stable isotope determination. To obtain the most reliable stable isotope data, materials should be treated in an identical fashion; within the same sequence of analyses, samples should be compared with working reference materials that are as similar in nature and in isotopic composition as feasible.

*In 2007, VSMOW2 replaced the almost exhausted VSMOW as the primary reference material and anchor to the VSMOW scale (for details, see <<http://www-naweb.iaea.org/NAALHIL/>> and <http://www-naweb.iaea.org/NAALHIL/docs/ref_mat/InfoSheet-VSMOW2-SLAP2.pdf>). For ^{18}O , VSMOW2 and VSMOW are indistinguishable. The scale itself remains unaltered and keeps its name ("VSMOW").

 www.iupac.org/web/ins/2005-022-1-200