

CHROMATOGRAPHIC SYSTEMS

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DISCUSSIONS

The discussions are arranged in the numerical order of papers within each Session, followed where appropriate by any general discussion and/or the Chairman's concluding remarks.

Glossary

THE papers presented at this Conference have been surveyed to examine the present use of some of the terms in solvent extraction theory and practice.

It is not intended here to recommend definitions or to indicate what terms should be used. However, the survey has indicated the wide variety of terms in use, many of which are synonymous, and it is hoped that as a result some greater uniformity will be encouraged and achieved in future. Readers familiar with a certain set of terms will be able to note the other terms generally equivalent in meaning.

It is clear that there is not complete agreement on the precise meaning of most terms between, for example, workers in the nuclear industry and petroleum industry, analytical chemists and metals extraction plant operators, or indeed between workers in the same field in different countries.

During the final Session of the Conference, the Chairman of the Solvent Extraction and Ion Exchange Group of the Society of Chemical Industry said that the Group hoped to be able to contribute to producing a definitive set of terms acceptable to all. The members of the Conference gave general encouragement to the Group to pursue this objective.

Readers are referred to this note at several points to indicate that the meaning of a term requires consideration.

1. Solvent extraction; Liquid-liquid extraction

'The transfer of one or more solutes between immiscible or partly miscible liquid phases.'

These two terms are used very extensively by authors from all countries as a general expression of the nature of the work described.

The term 'liquid extraction' is used only once or twice; it is ambiguous as it may also be applied to liquid-solids systems, as of course may the term 'solvent extraction' used in a more general sense.

2. Solvent; Extracting phase; Extract phase

'The liquid phase which contains the extracting agent.'

The word 'solvent' is also generally used to mean a 'diluent' alone or an 'extracting agent' alone as well as a solution of an 'extracting agent'. In systems other than organic/aqueous, more specific terms for the phases (molten salt, liquid metal) might be better.

3. Extracting agent; Extractive reagent; Extractant

'The material which interacts with the solute and thereby produces distribution between phases.'

The term 'extractant' is used to mean both a solution of 'extracting agent' and the pure 'extracting agent' alone.

4. Extraction; Forward extraction

'The transfer of a solute from a feed solution, usually aqueous, to a solvent.'

In this Conference the word 'extraction' is used mainly in the sense expressed above but is occasionally used to mean the removal of solute from any type of liquid phase into another.

'Forward extraction' is mentioned once in conjunction with the term 'back-extraction' (denoting 'stripping', as discussed below).

5. Stripping; Back-extraction; Re-extraction; Back-washing

'The transfer of solute from the solvent to another phase, usually aqueous.'

The term 'stripping' is most commonly used, although 'back-extraction' is also widely employed. Both terms are used without ambiguity in association

with 'extraction' or 'forward-extraction' respectively, but confusion can arise because 'stripping' may also mean 'scrubbing' as discussed below.

The term 're-extraction' is used in some papers; the word is subject to misinterpretation since it is infrequently used to mean a second process of extraction with a solvent different to that used earlier in a process. 'Secondary extraction' is used by some authors for this latter meaning.

'Back-washing' has been used in one paper; the word 'washing' may lead to confusion with later solvent cleaning. 'Back-washing' in the oil industry may mean 'scrubbing' with reflux.

6. Scrubbing

'The selective removal of contaminating solutes.'

'Scrubbing' is used very extensively. In one case the word 'stripping' occurs for this operation in conjunction with 'forward-extraction' followed by 'back-washing' (in the U.K. nuclear industry).

'Scrubbing' is used twice to mean the removal of solvent degradation products.

7. Equilibrium constant; Extraction constant; Distribution constant; Mass action constant

'An equilibrium constant of the reversible reaction postulated to describe the transfer of solute or other specified substance between two phases.'

There appears to be no general agreement on the precise meaning of the terms listed or on the use of activities or concentrations in the definition of terms.

There is, however, virtually complete agreement in using the word 'constant', which, although not perhaps always accurate, is important in differentiating from terms such as 'distribution coefficient' and its synonyms.

The connotation of 'extraction' can be ambiguous in some cases when 'extraction constant' is used.

The symbol K is almost always used.

8. Distribution coefficient; Distribution ratio; Extraction coefficient; Partition coefficient

'The ratio of the concentration of a solute in the organic phase to the concentration in the aqueous phase at equilibrium.'

The specified form of the solute varies but there is no unique usage of terms according to whether total concentration or concentration of a specific species is measured. The definition is inadequate for systems other than organic/aqueous. Activities rather than concentrations are sometimes used in the definition of 'partition coefficient', but this term is only occasionally used.

The two terms 'distribution coefficient' and 'distribution ratio' are most commonly used by authors from all countries. The use of 'extraction coefficient' is frequent but the logical extension to the use of a 'stripping coefficient' is non-existent in these papers.

Several authors have used 'distribution' for the solute and 'partition' for the extracting agent in the same paper.

A variety of other terms have been used rarely, viz. 'extraction ratio', 'extraction constant', 'partition ratio', 'distribution quotient', and 'distribution factor'.

If the word 'constant' can be avoided confusion with the 'equilibrium constant' can be avoided.

The symbols K_d , D , E and occasionally q and m are used.

9. Separation factor; Selectivity

'The ratio of the distribution coefficients of two solutes to be separated.'

Both terms are generally used by authors from all countries. Other expressions infrequently used are 'separation coefficient' and 'selectivity ratio'.

10. Decontamination factor

'The ratio of the proportion of the contaminant to the product before a purification step to the proportion after the purification step.'

This term is uniquely and unambiguously used in the nuclear industry but might well be employed in other contexts.

11. Extraction factor

'The distribution coefficient multiplied by the appropriate phase ratio used.'

12. Partition

'The separation of uranium and plutonium, usually in a process yielding separate streams of uranium and plutonium from a mixed uranium/plutonium feed.'

The use of 'partition' in the nuclear processing context is not, in these papers, subject to misunderstanding by confusion with a more general meaning of the word.

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