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The Phase Rule and the Notion of Substance

Needham, Paul (2010) *The Phase Rule and the Notion of Substance*. In: [\[2009\] EPSA09: 2nd Conference of the European Philosophy of Science Association \(Amsterdam, 21-24 October, 2009\) > EPSA 2009 Symposia](#).



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Abstract

In response to difficulties in understanding the notion of chemical substance at issue in Gibbs' phase rule, there is a long tradition of reformulating the simple statement of the rule. The leading idea is to rewrite the rule with a term for the number of substances actually present and to introduce additional terms making explicit the various kinds of restrictions which in the original formulation are taken to be incorporated into Gibbs' notion of the number of independent substances. Although the number of independent substances cannot in general be interpreted as the number of substances actually present, it is not an entirely derivative concept as the authors of the reformulations sometimes seem to presuppose. In particular, it is doubtful whether the number of substances actually present is a clearly delimited concept which can be determined prior to the application of the phase rule. In that case, the phase rule provides a useful source of information for the determination of the number and nature of the substances actually present in a mixture which should be properly reflected in an adequate interpretation of Gibbs' notion of independent substances. For this purpose, I propose a mereological interpretation of the way independent substances are related to the substances actually present which makes sense of the fact that the former are not uniquely fixed but can be chosen from the latter in several ways.

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Item Type: Conference or Workshop Item (UNSPECIFIED)
Additional Information: Symposium title: Chemical Kinds, Substances and Bonds

Keywords: Gibbs, chemical substance, phase, thermodynamics

Subjects: [Specific Sciences > Chemistry](#)

Conferences and Volumes: [\[2009\] EPSA09: 2nd Conference of the European Philosophy of Science Association \(Amsterdam, 21-24 October, 2009\) > EPSA 2009 Symposia](#)

Depositing User: [Paul Needham](#)

Date Deposited: 24 Mar 2010

Last Modified: 07 Oct 2010 11:19

Item ID: 5211

URI: <http://philsci-archive.pitt.edu/id/eprint/5211>

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