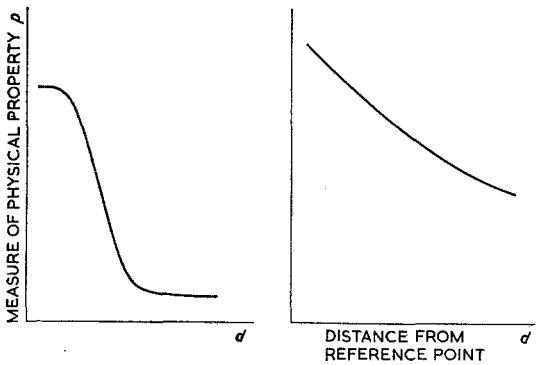
Letter

Property-graded Materials and Property-gradation – a Problem in Nomenclature

The suggestion is put forward below that there is a need for a word which will describe an attribute of materials of widespread technological significance.

The vocabulary of materials science is generally adequate, and such words as polycrystalline, monolithic, composite, anisotropic, etc are indispensable and well-understood. However, there is one omission which is noteworthy, and that is of a word or expression which will describe materials which – in the finished form – are either deliberately made inhomogeneous in terms of their physical properties or emerge in this condition after fabrication. This is shown diagrammatically in the figure. It shows two possible variations in the value of a given property along a line drawn at random through a solid.



A few examples are given below which illustrate this point.

(*a*) When a metal is case-hardened, the surface is different in properties from the bulk material.

(*b*) Glass may be toughened in a number of ways, e.g. the surface may be put into a state of compression by quenching or by diffusing into it certain cations.

(*c*) Polymer foams may show, as a result either of accident or design, a gradual change in properties proceeding from the outside to the middle of the specimens. This may take the form of a gradual change in density, modulus etc, or the surface may consist of a skin of monolithic polymer adjoining expanded material (as in bread, to take a simple example).

The number of examples could be multiplied, but these show that the present vocabulary of materials science is inadequate to describe an important real situation in materials. It is therefore suggested that *property gradation* and *property-graded* are useful additional terms for describing materials.

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Book Reviews

Science of Ceramics, Vol 4

Edited by G. H. Stewart

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This volume is the Proceedings of the 4th International Conference on "Science of Ceramics" held at Maastricht, Netherlands, April 1967. The papers are included in five sessions viz: The Effect of Mechanical Forces during Heat Treatment; Fabrication; Reacting during Sintering; Reactions in Multiphase Ceramics during Firing; Development of Ceramics for the Newest Applications.

The original Conference Programme shows each session to have one or two Introductory Lectures; unfortunately only one appears in the final Proceedings. This lack of Introductory Lectures detracts from the most important purpose of Conference Proceedings, that is the reporting of the present state of the art. One further omission is that of the discussions following each lecture; while this is often difficult to collect it does add to the usefulness of Conference Proceedings.

Nevertheless, the present Proceedings, Vol. 4, will be a useful addition to the excellent series "Science of Ceramics". D. I. MATKIN