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Editorial

When this journal first appeared in 1972 as the journal *The Texture of Crystalline Solids* it was devoted to all problems related to the orientation distribution of crystals in polycrystalline solids of any kind. When, later on, the title of the journal was changed to "Textures and Microstructures" this was to express more clearly that the texture of a material can never be considered separately without taking other structural parameters into account.

Textures have, thus far, been considered in essentially two different classes of material; metallic materials and natural rocks. Hence, preceeding editors of the journal were representatives of either the "metallurgical" or the "geological" branch. Nevertheless, it was always the textures of any kinds of crystalline solids which were in the scope of the journal. This tradition will be continued by the new editor taking over with the present issue.

Polycrystalline materials are built up of crystallites of the same or different crystal structure with different orientations of their crystallographic axes. If one considers the size, shape, and mutual arrangement of the crystals, just knowing that their crystallographic orientations are different, but mostly without specifying the orientations, this is usually called the *microstructure* of the material. If, on the other hand, one considers the crystallographic orientations of the crystals, just knowing that they must have different positions in the material, then this is called the *texture* of the material. Texture and microstructure are thus two specific but complementary views of the general structure of a polycrystal, the first described in terms of the three *positional coordinates*, the second in terms of the three *angular coordinates* of the crystallites. The two aspects of a polycrystal have been developed widely and independently of each other. The first has lead to quantitative stereo-

logy, and the second to quantitative texture analysis. It is evident that a comprehensive characterization of a polycrystalline material needs both these aspects, the positional and the orientational, at the same time. It is, however, also evident that this requires the measurement and handling of structural parameters in a six-dimensional combined "position—orientation" space. Although in principle desirable, this comprehensive six-dimensional structure characterization of polycrystals is still the exception. In practice, emphasis is usually put either on the positional or the orientational parameters of the structure; the first primarily determined by light- or electron-optical imaging methods, the second mostly by X-ray, neutron, or electron diffraction methods.

In this sense, the journal *Textures and Microstructures* will primarily be devoted to the textural, i.e. the orientational aspect of polycrystalline materials but also taking into account, if necessary, microstructural, i.e. positional aspects. This may especially be done by considering certain generalizations of the "classical" definition of the texture as a pure orientation distribution function. Such generalizations are for example (but not exclusively) orientation correlations of grains in different positions or inhomogeneous textures i.e. orientation distribution functions varying from position to position within the material, and of course, textures in multiphase materials. The merely microstructural aspect, without taking crystal orientation into account, will not be in the centre of interest of the journal.

Textural and microstructural problems will be considered in any kinds of crystalline solids, i.e. metallic or non-metallic, organic or inorganic materials, be they artificially produced for technological usage or be they of natural origin such as natural rocks, salt or other mineral deposits, soils, or ice. The methods of texture characterization in all these materials bear many similarities; the main differences being due to the different symmetry classes of the constituent crystals.

One of the most prominent problems, in the pursuit of which texture studies are required, is the relationship between the macroscopic anisotropy of a physical property of a material and the corresponding microscopic anisotropy of the constitutive crystals. In the first approximation, the macroscopic anisotropy is the mean value of the microscopic ones with the texture being the weight function. In a higher approximation, however, other structural parameters such as orientation correlation functions need to be taken into account. The anisotropy of macroscopic properties of materials, being either profitable or detrimental, is the basis of most of the technological interest in textures.

If the texture of a technological material is not explicitly controlled this may lead to texture changes from batch to batch and hence to property changes which may easily be in the range of 20–50% or even more. As long as the uncertainty of the influence of other structural parameters on the properties of a material was of the same or even greater magnitude a strict texture control was only of minor importance. In an advanced materials technology, however, the property tolerances have to be and can be kept below this limit. Hence, texture control becomes a decisive factor towards high precision materials. This is one of the reasons for the increasing activity in the field of texture investigations in the last years.

Texture control is based on the quantitative knowledge of the influence of solid state processes of all kinds on the texture, such as primary crystallization, plastic deformation, recrystallization, phase transformation, and others. The study of all these influences and the elaboration of quantitative theories of texture development is thus a prerequisite of quantitative texture control. On the other hand, texture changes can also be used as a sensitive tool or probe in order to investigate the above mentioned solid state processes themselves. The study of the exact orientation distribution function and its changes during plastic deformation may, for example, reveal details of the underlying glide mechanisms.

From the same reason the texture of a material may be considered as an inner documentation which contains information on the material's history. This principle is being used in geological sciences in order to obtain information about rock forming processes which occurred millions of years ago. The same principle can also be applied in materials technology as a means of failure analysis or life time prediction.

Finally, property measurements in polycrystals are often based on the assumption of random orientation distribution as in, for instance, X-ray phase analysis or X-ray stress analysis. Since, however, the completely random state is a rare exception to the normal case in a polycrystal, quantitative texture analysis is a necessary prerequisite for a correction interpretation of the corresponding measurements.

Textures and Microstructures will provide a medium of publication for work in all these fields. This comprises experimental techniques of texture determination by X-rays, neutrons, electrons, or others as well as the mathematical technique of pole figure inversion, i.e. the calculation of the complete orientation distribution function from pole figures. It comprises fundamental research as well as technological applications

and it comprises all kinds of crystalline solids including especially metals and natural rocks but all others equally well. The journal will accept contributed original papers and it will invite review papers. Short communications will also be welcome.

During its history since 1972 the journal *Textures and Microstructures* has seen periods of rapid growth and other periods where its appearance was rather sluggish. It is not the place, here, to analyze in detail the various reasons for this development. It is, however, my feeling that the field of textures of polycrystalline materials is well defined and clearly enough outlined to justify a specific journal of its own and that it is also large enough to fill this journal and to allow it to flourish. As the new editor, I hope that it will be accepted in this way again as it formerly was by the texture community.

H.-J. BUNGE