On Fundamental Concepts of Multiphase Micropolar Materials

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The kinematics and the balance equations for a multiphase micropolar material of \( n \) constituents \( \varphi^\alpha \) are presented. Similar to mixture theories, each constituent is assigned its own motion and, due to micropolarity, its own micro-motion . . .

1 Introduction

The mechanical behavior of multiphase materials is of interest in several areas of engineering, e. g. in geomechanics, soil mechanics, biomechanics, and powder metallurgy . . .

2 Kinematics in Mixture Theories

In mixture theories, material points of each constituent \( \varphi^\alpha, \alpha = 1, \ldots, n \), occupy the same spatial point in the actual configuration (superimposed continua). The volume element \( dv \) is given by the sum of the partial volume elements \( dv^{\alpha} \), which, on the microscale, are occupied by \( \varphi^\alpha \) only.

\[
dv = \sum_{\alpha=1}^{n} dv^{\alpha}
\]

(1)

The combination of equations (1) and (2) leads to ...

Figure 1. Reference and actual configuration of a binary mixture ...

... is shown in Figure 1.

An overview concerning the macroscopic porous media approach up to 1983 is presented by Bedford and Drumheller (1983).

The reader, who is interested in details to micropolar theories, is referred e.g. to Ehringen (1964) . . .
Examples of application of ideas presented in this section are given in Christov et al. (1996)...

This approach was discussed by Bowen (1980) ...

An example of such systems is the following 1D generalized Boussinesq equation (Maugin and Christov, 1999) ...

Most of these are reviewed in a synthesis work (Maugin, 1999a,b; Maugin and Christov, 1999)...

References


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