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RECENT ADVANCES IN CONTINUUM ELECTROMAGNETISM OF MULTIFUNCTIONAL MATERIALS

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ABSTRACT

So-called multifunctional or “smart” materials have become an increasingly vital field of research over the past decades. Key characteristics can be unique electromagnetic, mechanical or even thermal material properties. However, they are particularly remarkable for their multi-field couplings and the resulting properties, e.g., shape memory alloys. Application areas include, inter alia, sensor and actuation technology, microelectronics as well as energy harvesting. Prominent examples of such materials are ferroelectrics and -magnetics possessing inherent electro- and magneto-mechanical couplings, respectively, on the constitutive level due to their special microcrystalline structure. However, the irreversibility of the underlying processes leading to a pronounced non-linear material behavior is always accompanied by dissipation, which must be adequately considered in a thermodynamic context. Finally, assessment of material failure requires an extended theory of fracture mechanics incorporating multi-physical loading.

This mini-symposium is devoted to collecting specialists from this interdisciplinary domain of research in order to share and elaborate on recent advances. The two main focuses are material modelling covering scale-bridging and homogenization techniques within mutli-scale approaches and novelties in the fields of energy harvesting and fracture mechanics.