Seminar über Fragen der Mechanik

zu folgendem Vortrag wird herzlich eingeladen

Freitag, 21.09.2012, 11:00 Uhr, Egerlandstr. 5, Raum 0.044

Implicit constitutive relations for electro-elastic bodies

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In a series of recent works, Rajagopal and co-workers [1,2] have studied new classes of elastic bodies, which are neither Green nor Cauchy elastic bodies. One of these new classes of elastic bodies can be described by constitutive implicit relations of the type $f(\sigma, \mathbf{b}) = \mathbf{0}$, where σ is the Cauchy stress tensor and $\mathbf{b}$ is the left Cauchy Green deformation tensor.

In the present work we consider the extension of the theories described previously to the case of modelling the behaviour of electro-elastic bodies. If τ is the total stress tensor [3], $\mathbf{E}$ the electric vector field and $\mathbf{D}$ the electric displacement, we show some new classes of electro-active bodies based on the assumption that they are related through a tensor implicit relation of the form $f(\tau, \mathbf{b}, \mathbf{E}, \mathbf{D}) = \mathbf{0}$, and a vector implicit relation of the form $g(\tau, \mathbf{b}, \mathbf{E}, \mathbf{D}) = \mathbf{0}$. Interesting subclasses are obtained, when we assume that the gradient of the displacement field is small, but the behaviour of the body is nonlinear (see [4] for the counterpart of this problem in the purely elastic case).

[1] Rajagopal, K.R.: On implicit constitutive theories. Appl. Math. **48**, 279-319 (2003)

[2] Rajagopal, K.R., Srinivasa, A.R.: On a class of non-dissipative solids that are not hyperelastic. Proc. R. Soc. A **465**, 493-500 (2009)

[3] Dorfmann, A., Ogden, R.W.: Nonlinear electroelasticity. Acta Mech. **174**, 167-183 (2005)

[4] Bustamante, R., Rajagopal, K.R.: A note on plain strain and stress problems for a new class of elastic bodies. Math. Mech. Solids **15**, 229-238 (2010)

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