

Multidimensional Thermoelasticity for Nonsimple Materials –
Well-Posedness and Long-Time Behavior

ABSTRACT

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We consider the PDE system

$$\begin{aligned}\rho\ddot{u}_i &= (A_{iJKj}u_{j,K} - \beta_{Ji}\dot{\tau} - (C_{iJKLIj}u_{j,IL} + M_{iJKL}\tau_{,L})_{,K})_{,J} - E(|\dot{u}|)\dot{u}_i, \\ a\dot{\tau} &= -\beta_{Ki}\dot{u}_{i,K} + m_{IJ}q_{I,J} + M_{jLKI}u_{j,LKI} + K_{IJ}\tau_{,IJ}, \\ \kappa\dot{q}_i &= \dot{\tau}_{,i} - q_i\end{aligned}$$

in $\Omega \times (0, \infty)$ subject to the boundary conditions

$$u_i = 0, \quad u_{i,J} = 0, \quad \tau = 0 \text{ in } \partial\Omega \times (0, \infty)$$

and the initial conditions

$$\begin{aligned}u_i(\cdot, 0) &= u_i^0, \quad \dot{u}_i(\cdot, 0) = \dot{u}_i^0, \\ \tau(\cdot, 0) &= \tau^0, \quad \dot{\tau}(\cdot, 0) = \dot{\tau}^0, \quad q_i(\cdot, 0) = q_i^0 \text{ in } \Omega.\end{aligned}$$

Under certain assumptions, well-posedness and asymptotic stability of the system are obtained. Moreover, we prove the lack of asymptotic stability in the absence of the frictional damping.

This is a joint work with Michael Pokojovy, Karlsruhe Institute of Technology (Germany).