Modelling and Analysis of Surface Damage Problems

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We address the analysis of nonlinear PDE systems describing joint volume and surfaces processes in thermoviscoelasticity. In particular, we focus on the modelling and the analytical investigation of contact problems with adhesion between a body and a rigid support. As a process on a surface, from a mathematical standpoint, the phenomenon of the adhesion is modeled by resorting to a surface damage theory (M. Frémond, *Phase Change in Mechanics*, Springer-Verlag, 2012). The associated PDE systems are recovered from the balance laws of Continuum Mechanics, encompassing (in a generalized principle of virtual power) the effects of micro-forces and micro-motions which are responsible for the breaking of the microscopic adhesive bonds. They couple the quasi-static momentum balance, the equation for the surface damage parameter, and the equation for the temperature in the bulk domain and on the contact surface.

We investigate the related initial-boundary value problems and in particular the issue of existence of global-in-time solutions.