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Equation of State of Phenomenological Mechanochemistry of Damage MICHAEL GREENFIELD, US Army Rsch Lab - Aberdeen — Traditional damage theory deals with distributed microcracks rather than with individual cracks. This theory adds just one additional parameter to the set of classical thermodynamic parameters of deformable solids, like strain and temperature. Basically, the traditional damage theory reflects only one experimental observation: the elastic modules become smaller with growing damage. Contrary to the traditional damage theory, the Phenomenological Mechanochemistry of Damage (PMD) includes, in addition to the bulk elastic energy, the energy associated with braking/recovery of chemical bonds. Therefore, in addition to the elasticity equations it includes the equation, describing evolution/dynamics of chemical bonds. Although "chemical bonds" is a nano-scale concept, we treat the bonds using phenomenological approach. The additional equation of damage evolution is of the rate type, thus, making the whole model rate-dependent (even in quasi-static approach.) In the paper, we review some earlier results and present the novel ones with emphasis on the rate-dependent effects.

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