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Phenomenological Mechanochemistry of Damage in Electromagnetic Fields MICHAEL GRINFELD, The US Army Research Laboratory, PAVEL GRINFELD, Departmen of Mathematics, Drexel University, Philadelphia — Basic principles of Phenomenological Mechanochemistry of Damage (PMD) have been formulated in Grinfeld and Wright [1]. To some extent, it is a natural extension of the traditional damage theory, presented by Kachanov [2]. Contrary to Kachanov's approach, the PMD theory 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 generalized them by taking into account electromagnetic effects.

1. Grinfeld, MA., Wright, TW. Thermodynamics of solids: recent progress with applications to brittle fracture and nanotechnology. Paper presented at 23rd U.S. Army Science Conference; 2002; Orlando (FL).

2. Kachanov, LM. Introduction to continuum damage mechanics. Dordrecht: (Netherlands): Martinus Nijhoff Publishers;1986.

Michael Greenfield
The US Army Research Laboratory

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