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Breakdown of disordered media by surface loads JAKOB KNUDSEN, ALI MASSIH, Malmo University — An interface layer connecting two parts of a solid body is modeled by N parallel elastic springs connecting two rigid blocks. We load this system by a shear force acting on the top side. The springs are assumed to have equal stiffness but are ruptured randomly when the load reaches a critical value. For this system, we calculate the shear modulus as a function of the order parameter, describing the state of damage, and also the worn material size distribution. In particular, we evaluate the relation between the damage parameter and the applied force and explore the behavior in the vicinity of material breakdown. Using this simple model for material breakdown, we show that damage caused by applied shear forces is analogous to a first-order phase transition. The scaling behavior of the shear modulus with the order parameter is explored analytically and numerically close in the vicinity of the critical order parameter when the shear load is close but below the threshold force that causes material breakdown. Our model calculation represents a first approximation of a system subject to wear induced loads.

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