Competition between Diffusion and Fragmentation: Evolution of polycrystalline materials under stress JOACHIM MATHIESEN, Physics of Geological Processes, University of Oslo, Norway, JESPER FERKINGHOFF-BORG, MOGENS H. JENSEN, Niels Bohr Institute, Copenhagen, Denmark, POUL OLESEN — We propose a dynamical model for the grain evolution in polycrystalline materials. The model is based on the competition of the common physical processes diffusion and fragmentation. Specifically, we formulate a rate equation in terms of the distribution N(x, t) of grains or crystallites of linear size x at time t. The grains either grow by boundary diffusion or shrink by deformation and subsequent fragmentation. The equation leads to a third order differential equation which we solve exactly in terms of Bessel functions. The stationary state is a universal Bessel distribution described by one parameter. Our model perfectly fits experimental data on grain evolution in sheets of ice.

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