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Erosion in extruder flow MIRON KAUFMAN, PETRU S. FODOR, Cleveland State University — A detailed analysis of the fluid flow in Tadmor's unwound channel model of the single screw extruder is performed by combining numerical and analytical methods. Using the analytical solution for the longitudinal velocity field (in the limit of zero Reynolds number) allows us to devote all the computational resources solely for a detailed numerical solution of the transversal velocity field. This high resolution 3D model of the fluid flow in a single-screw extruder allows us to identify the position and extent of Moffatt eddies that impede mixing. We further consider the erosion of particles (e.g. carbon-black agglomerates) advected by the polymeric flow. We assume a particle to be made of primary fragments bound together. In the erosion process a primary fragment breaks out of a given particle. Particles are advected by the laminar flow and they disperse because of the shear stresses imparted by the fluid. The time evolution of the numbers of particles of different sizes is described by the Bateman coupled differential equations used to model radioactivity. Using the particle size distribution we compute an entropic fragmentation index which varies from 0 for a monodisperse system to 1 for an extreme poly-disperse system.

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