# Evolution equations with irreversibility constraints

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**Abstract**

In this talk, we shall overview recent developments in evolution equations with irreversibility constraints. This class of evolution equations has been studied in view of damage and fracture mechanics; indeed, complete irreversibility is one of intrinsic natures of fracture and damage. Due to the irreversibility constraint, such equations are classified as fully nonlinear problems, and hence, there seems to be only a limited number of studies on long-time dynamics as well as qualitative properties of solutions. We shall start with simple toy models such as linear diffusion with irreversibility constraints, and then, move on to variants of nonlinear diffusion and Allen-Cahn equations. In particular, traveling wave dynamics of the constrained Allen-Cahn equation exhibits a clear contrast to that of classical one. Furthermore, we shall also discuss evolution equations (with irreversibility constraints) complying with more features intrinsic to fracture models. They includes a full system of a fracture model, more precisely, a phase-field model of complete damage.