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Cooperative strings and glassy interfaces. MAXENCE ARUTKIN, THOMAS SALEZ, ELIE RAPHAEL, JAMES FORREST, ESPCI — We present a minimal theory of glass formation based on the ideas of molecular crowding and string-like cooperative rearrangements. In the bulk case, we obtain a scaling expression for the number of particles taking part in cooperative strings as a function of density, and we recover the Adam-Gibbs description of glassy dynamics. Then, by including thermal dilatation, the Vogel-Fulcher-Tammann relation is derived. Moreover, the random and string-like characters of the cooperative rearrangements permit the prediction of a temperature-dependent expression for the cooperative length of bulk relaxation. This theoretical picture enables the exploration of the influence of sample boundaries, in various geometries where the system size becomes comparable to the bulk cooperative length, such as thin supported films and nanoparticles made of polymers. We also discuss the dependence of the glass temperature on molecular weight.

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