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*The Hele-Shaw problem as a mesa limit of Stefan problems: existence, uniqueness, and regularity of the free boundary.*

We study a Hele-Shaw problem with a mushy region obtained as a mesa type limit of one phase Stefan problems in exterior domains. We study the convergence, determine some of the qualitative properties and regularity of the unique limiting solution, and prove regularity of the free boundary of this limit under very general conditions on the initial data. Indeed, our results handle changes in topology and multiple injection slots. This paper is joint work with Marianne Korten and Charles Moore. (Received September 06, 2006)