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Universal Lower Limit on Vortex Creep in Superconductors SERENA ELEY, Los Alamos National Laboratory, MASASHI MIURA, Seikei University, BORIS MAIOROV, LEONARDO CIVALE, Los Alamos National Laboratory — In high-temperature superconductors, creep (the rate of thermally-activated vortex motion, \( S \)) considerably limits the current carrying capacity. The magnitude of \( S \) is thought to somehow positively correlate with the Ginzburg number (\( Gi \)), which depends on the critical temperature (\( T_c \)) and material-specific length scales. Early measurements of \( S \) in iron-based superconductors unveiled rates comparable to YBa\(_2\)Cu\(_3\)O\(_{7-\delta}\), which was puzzling given that \( Gi \) is orders of magnitude lower in iron-based superconductors. Here, we report very slow creep in BaFe\(_2\)(As\(_{0.67}\)P\(_{0.33}\))\(_2\) films and evince the efficacy of BaZrO\(_3\) inclusions in reducing \( S \) at high fields. We propose that there is a universal minimum realizable \( S \sim Gi^{2/3}(\frac{T}{T_c}) \), and show that it has been achieved in our films, a few other superconductors, and violated by none. This hard constraint has two broad implications: first, the creep problem in high-\( T_c \) superconductors cannot be fully eliminated and there is a limit to how much it can be ameliorated, and secondly, we can confidently predict that any yet-to-be-discovered high-\( T_c \) superconductor will have fast creep.

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