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Thermal Runaway in Jammed Networks JEREMY LECHMAN, COLE YARRINGTON, DAN BOLINTINEANU, Sandia National Laboratories — The study of thermal explosion has a long history. Names such as Semenov and Frank-Kamenetskii are associated with classical model descriptions under particular assumptions. In this talk we revisit this problem with particular focus on the latter's model for conduction dominated thermal transport and Arrenhius-type reaction chemistry. We extend this description to the case of inhomogeneous microstructure generated by packing mono-sized spheres via a well-defined "Jamming" protocol. With these material structures in hand, we recast the Frank-Kamenetskii problem into a reduced-order network form for conduction in particle packs. With this model we can efficiently investigate the variability of the time to ignition due to the random microstructure. Additionally, we propose a modal decomposition and stability analysis of the model akin to stability of linear systems. We highlight the physical insights this approach can give with respect to questions of material dependent performance variability. Sandia National Laboratories is a multiprogram laboratory managed and operated by Sandia Corporation, a Lockheed-Martin Company, for the U. S. Department of Energy's National Nuclear Security Administration under Contract No. DE-AC04-94AL85000.

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