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Conductivity of granular metals YEN LEE LOH, VIKRAM TRIPATHI, Cambridge University, MISHA TURLAKOV, Oxford University — The conductivity of granular metals, which consist of isolated metallic regions embedded within an insulating matrix, is often experimentally seen to obey the 'soft-activation' law $\sigma \propto e^{-\sqrt{T_0/T}}$ over a very large temperature range, as opposed to the Arrhenius 'hard-activation' law $e^{-E_c^*/T}$ that would have been expected from basic Coulomb blockade theory. Our extensive perturbative and path-integral Monte-Carlo analysis of the Ambegaokar-Eckern-Schön (AES) model for a regular array of grains gives an Arrhenius law and does not reveal a soft-activation behaviour even at the lowest temperatures we considered. This result is in agreement with recent experiments on silver nanoparticle arrays with controllable disorder, and suggests that the soft-activation law should be attributed to disorder.

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