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Alfred W Hubler* (a-hubler@uiuc.edu), Department of Physics, UIUC, 1110 W Green Street, Urbana, IL 61801. *On the complexity of the dynamics and structure of ramified charge transportation networks in an electromechanical system.*

We study the agglomeration process of conducting particles under the influence of an electric field [1]. The dynamical formation of the network consists of three growth stages: (I) strand formation, (II) boundary formation, and (III) geometric expansion. We introduce measures which describe growth with punctuated equilibriums. We show that the average adjacency statistically robust network features, as well as the number of termini and the number of branch points. We also find that the networks are usually open-loop tree structures; indeed, we find that loops are unstable in the network. Further we show that the final topology of the network is sensitive to the initial conditions of the particles, but the number of termini and the number of branching points can be predicted with a minimum-spanning-tree growth algorithm.

[1] J. K. Jun and A. W. Hubler, Proceedings of the National Academy of Sciences, 102, 536-540(2005). (Received February 14, 2005)