

Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Fracture: Genesis of Dielectric Breakdown MAYANK MISRA, SANAT K KUMAR, Columbia University — Despite abundant experimental study on dielectric properties of polymers, the origins of the high dielectric breakdown in polymers remains an open question. Although dielectric breakdown in a polymer is a non-trivial problem, there has been a significant increase in understanding the phenomena in polymeric materials. The classical models developed for understanding the failure have been deterministic in nature: that is the breakdown occurs as a direct effect of an earlier event or condition produced by crossing over a threshold electric field. Conventionally the prediction of dielectric strength has focused on ground state energy calculation, thus restricting the analysis of the breakdown process to purely electronic. While this provides reasonable predictions for very low-temperature systems, we believe that the mechanism for the breakdown in polymers is significantly different. Using molecular dynamics, we delineate dielectric breakdown in polymeric capacitors. Our simulation results suggest that fracture mechanics drives electromechanical breakdown, which dominates over electronic breakdown at relevant operating temperatures.

Mayank Misra
Columbia University

Date submitted: 12 Nov 2016

Electronic form version 1.4