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Power and Charge Deposition and Electron Transport in Disordered SiO2 Layers Under Electron Bombardment[1] GREGORY WILSON, JR DENNISON, AMBERLY E. JENSEN, JUSTIN DEKANY, USU Materials Physics Group — Power and charge deposition in multilayer dielectrics from electron bombardment is dependent on the flux and energy-dependent electron penetration depth of the electron beam. Using the Continuous Slow Down Approximation (CSDA), a composite analytical formula has been developed to approximate the electron range which can be related to the dose rate, deposited power and Radiation Induced Conductivity (RIC). Based on the constituent layer geometry and material, the deposited charge can also be inferred. Three separate pulsed electron beam experiments were conducted to measure charge deposition, power dependent cathodoluminescence and RIC. The power and charge deposition experiments measured the net surface potential, electrode currents and electron induced luminescence of disordered SiO2 multilayer dielectrics with a grounded or floating conductive middle layer, using beam energies from 200 eV to 25 keV at <40 K to room temperature. These results showed that the power and charge deposition's dependence on electron beam flux and incident energy compare favorably with the model predictions. The RIC experiments measured electrode currents using disordered SiO2 layers from <40 K to >320 K with dose rates from 10-5 Gy/s to 10-1 Gy/s. The onset of RIC in the energy-dependant depth of the RIC region provides an explanation for observed retrograde charging.

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