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Power and Charge Deposition in Multilayer Dielectrics from Monoenergetic Electron Bombardment[1] GREGORY WILSON, J.R. DENNISON, AMBERLY EVANS JENSEN, JUSTIN DEKANY, USU Materials Physics Group — Power and charge deposition in multilayer dielectrics from electron bombardment is dependent upon the flux and electron range of the electron beam, where the range,–also known as the penetration depth—is dependent upon the incident beam energy. Using the Continuous Slow Down Approximation (CSDA), a composite analytical formula has been developed to relate the electron range to the dose rate and subsequently to the deposited power in each subsequent layer. Based on the constituent layer geometry and material, the deposited charge can also be inferred. To validate these models two separate experiments were conducted, one based on the net surface potential and the second on electron induced luminescence. The first experiment used a disordered SiO_2 based multilayer dielectric with a conductive middle layer. The sample was charged using 15 s pulses from an electron beam with an energy range from 200 eV to 5 keV. The second experiment also used a disordered SiO_2 based multilayer dielectric, but with energies from 5 keV to 25 keV. Results of these experiments showed the power and charge deposition's dependence on electron beam flux and incident energy, which compare favorably with the model predictions.

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