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Enhanced Electron Yield Measurements of Extremely Low-Conductivity High-Yield Dielectrics JUSTIN CHRISTENSEN, JR DENNISON, Utah State Univ, USU MATERIALS PHYSICS GROUP TEAM — New methods to measure intrinsic (uncharged) electron yield have been developed and used to study high-yield, low-conductivity dielectrics. Electron yield—the ratio of emitted to incident electrons—determines how a material will acquire charge under electron bombardment and is extremely difficult to measure for highly insulating materials due to both negative and positive charge build up. The enhanced method uses a pulsed (3 s), low-flux ($3{\bullet}10^4$ electrons per cm^2 per pulse) electron beam to probe materials and a hemispherical grid retarding field analyzer to measure the absolute energy spectra of emitted charge. A low-energy electron flood gun and a high-energy high-intensity UV LED are used between pulses to neutralize accumulated charge. Data for each pulse are analyzed to determine the total incident and emitted charge, and hence the yield; point-wise analysis of pulse oscilloscope trace data allows yield determination for charge accumulation as low as 300 electrons per cm^2. Electrons yields down to ˜20 eV incident energy can be measured due to enhanced beam stability and reduced noise. To validate these system changes, measurements of common materials are compared to previous measurement methods used by several investigators. The resulting yield curves more closely match the expected model compared to previous methods. Charging due to electron bombardment is very important to understand and mitigate in applications such as spacecraft charging, electron microscopy, and other electron gun applications.

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