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Constant Voltage Conductivity Measurements of a Critical Temperature Transition in Low Density Polyethylene[1] MEGAN LOVELAND, ZACHARY GIBSON, BRIAN WOOD, JR DENNISON, Utah State University — Temperature-dependent constant voltage conductivity measurements of the highly disordered insulating polymeric material low density polyethylene (LDPE) were made to investigate a transition of electrical transport mechanisms from variable range hopping to multiple trapping at a critical temperature. Such a transition is evidenced as a change of slope in a double logarithmic plot of conductivity versus temperature at the critical temperature, T_c. Below T_c variable range hopping, with a $T^{-1/4}$ dependence, is the dominant mechanism; above T_c multiple trapping mechanisms, with linear T^{-1} dependence dominate. To investigate this transition, the sample temperature, T, was varied from ˜230 K to 300 K, based on prior experimental evidence which estimated T_c to be ˜268 K, along with theoretical models which predict T_c ˜255 K. A constant voltage conductivity system was used, with current measured in parallel plate geometry with a steady voltage applied across 25 m thin film LDPE samples using Ohm's law. Experiments were conducted *in vaccu*, with a lower bound in measurable conductivities of ˜$1{\cdot}10^{-21}$ $(\Omega\text{-cm})^{-1}$ due to fA current resolution. Transitions seen in other electron transport measurements and related structural phase transitions at comparable temperatures are discussed.

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