Simultaneous Measurements of Space Charge and External Current for LDPE Films with Various Densities

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Positive charges packet is frozen inside the bulk of a low-density polyethylene(LDPE) film after subjecting to 1.5 MV/cm of DC electric field. In this paper, simultaneous measurements of space charge dynamics and external current through LDPE are carried out by using a pulsed electroacoustic (PEA) method in order to understand this phenomenon. By carrying these measurements simultaneously, we can understand further about the physical process during the freezing period. External current shows an increase as the electric field is up to 5 MV/cm though the velocity of the charges decreases. This implies that, beside the charges packet, there are also moving charges in the freezing region. 3 type of samples, LDPE neat sample, LDPE with paraffin sample and LDPE with polyisobutylene sample are prepared. In comparison with LDPE neat sample, the LDPE with paraffin sample tends to suppress the positive charges penetration hence showing a lower current flow. On the other hand, LDPE with polyisobutylene sample shows a relatively fast positive charges packet penetration and a higher current flow.

Keywords: LDPE, external current, space charge, simultaneous measurements, paraffin, polyisobutylene