

LDPE/GNP Insulating Nanocomposites for Effective Reduction of Space Charge Accumulation in HVDC Cables

박지선[†], 김영선, 박다슬, 남진호¹, 김윤진
전자부품연구원; ¹LS전선
(jisun.park@keti.re.kr[†])

We have demonstrated a straightforward hydrophobic surface modification of graphene nanoplatelets (GNPs) through a defect-healing process to fabricate well-dispersed insulating low-density polyethylene (LDPE)/GNP nanocomposites, and have confirmed their effective suppression of space-charge accumulation. Without any organic modifiers, GNPs containing oxygen-based functional groups at the edges were successfully reduced at optimal high-temperature defect-healing condition, and modified to have hydrophobic surface properties similar to those of the LDPE matrix. The degree of dispersion and the reproducibility of the mechanically melt-mixed LDPE/GNP nanocomposites were immediately analyzed by thickness-normalized optical absorption measurement. In the LDPE matrix, below the percolation threshold concentration, well-dispersed GNP fillers effectively acted as trapping sites under high electric fields, resulting in the successful suppression of packet-like space-charge accumulation (field enhancement factor = 1.04 @ 0.1 wt% LDPE/GNP nanocomposite).