



# Electrical Tree Inception Voltage and Propagation in XLPE Containing Silica Nanofiller

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**Abstract.** This paper presents the tree inception voltage and electrical tree propagation in XLPE containing silica nanofiller. The concentration of silica nanofillers in XLPE was 0 wt%, 0.5 wt%, 1.0 wt%, 1.5 wt% and 1.75 wt%. The needle plate electrodes were used to analyze the tree inception voltage and electrical treeing propagation. The structure and the propagation length of electrical tree growth were analyzed after 20 min of tree inception voltage. The result of tree inception voltage and the electrical tree propagation in XLPE containing silica nanofiller was compared with pure XLPE composite. The silica nanofiller with the concentration of 1.5 wt% revealed the higher TIV and slower propagation of electrical tree in the XLPE nanocomposite.

**Keywords:** XLPE · Silica nanofiller · Electrical tree propagation

## 1 Introduction

Cross-linked polyethylene (XLPE) has been widely employed in high voltage (HV) cable insulation because of its outstanding dielectric and mechanical properties. However, the biggest issue in XLPE is electrical treeing phenomena. The development of electrical tree cause of tree inception occurs in XLPE cable insulation and continuously develops until the power cable breakdown. Inception, propagation and breakdown are the three stages of electrical tree propagation [1–5]. Because of their superior performance, such as improving tree inception voltage (TIV) and inhibiting rapid tree growth, the use of nanofiller in polymeric materials has recently gained attention due to