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### Impact of thermal aging on dielectric and physicochemical properties of MV XLPE cables

**Abstract:**

This work explores the impact of thermal aging on the dielectric and physicochemical properties of medium-voltage XLPE cables, with particular attention to cable structure. Complete cable sections and isolated extruded insulation, manufactured by ELSEWEDY ELECTRIC, were aged at 80 °C and 100 °C for 5000 h and at 140 °C for 1500 h. Broadband dielectric spectroscopy showed increasing dielectric losses (tan δ) with aging severity; complete cables generally exhibited higher low-frequency losses attributable to interfacial polarization at insulation–semiconductor boundaries absent in extruded samples. Fourier-transform infrared spectroscopy (FTIR) and differential scanning calorimetry (DSC) indicated progressive oxidative degradation and reduced crystallinity with temperature. Scanning electron microscopy coupled with energy-dispersive X-ray spectroscopy (SEM-EDS) revealed thermally induced surface micro-cracking and oxygen enrichment most pronounced after 140 °C exposure linking morphological damage and chemical oxidation to electrical response. Taken together, the results demonstrate that evaluating full cable architecture, rather than isolated materials alone, is essential for realistic condition assessment and lifetime prediction of XLPE-insulated medium-voltage cables operating under thermal stress.

### Biography

**Yasmina Sebbane** is an Assistant Professor (MCB) at the University of Science and Technology Houari Boumediene (USTHB), Algiers. She earned her Electrical Engineering degree from the National Polytechnic School of Algiers (ENP), a Master's in PIE from ENS in 2015, and a PhD in Electrical Engineering from ENP in 2023. Her research focuses on the thermal aging, water adsorption, and multi-scale characterization of power cables, linking physicochemical, mechanical, and dielectric properties. She has published in journals such as ENPESJ and TDEI, and presented her work at several national and international conferences, contributing to advancing knowledge in cable insulation.