TITLE

Optimizing Insulation Performance in High Voltage Systems Through Green Insulation Technologies

ABSTRACT

This Research work aims to Investigate and develop eco-friendly insulation materials for high-voltage systems, focusing on their electrical, thermal, and mechanical properties. Optimize and validate advanced insulation techniques using green materials to enhance system efficiency, reliability, and environmental sustainability. This study investigates the Enhancement of dielectric properties in aged oil blends enhanced with green nanoparticles. It assesses aged insulation kraft paper degradation using Atomic Force Microscopy (AFM). Transformer oil, a critical component in electrical insulation systems, degrades over time, affecting its dielectric performance and the integrity of associated insulation materials. The incorporation of green nano aimed to improve the dielectric strength and stability of the oil blends. Concurrently, the degradation of aged insulation kraft paper was analyzed using AFM to provide a microstructural perspective on the physical changes occurring due to aging. The results indicated that adding green nanoparticles significantly enhanced the dielectric properties of the aged oil blends, improving insulation performance. AFM assessment revealed notable morphological degradation in the kraft paper using the AI techniques.