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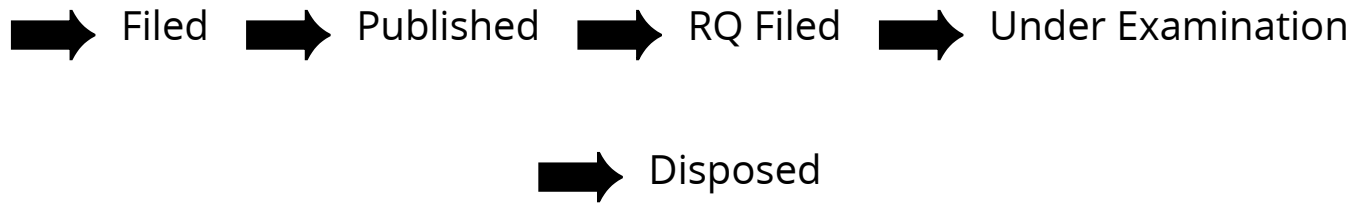
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| FIELD OF INVENTION | PHYSICS |
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(57) Abstract :

Power and distribution transformers play a key role in ensuring the reliability and stability of grid-connected power systems. Insulation failures such as partial discharges, internal faults, and overheating during prolonged overloading account for approximately 13% of total transformer faults and the major cause of these failures is decrease in the dielectric strength of transformer oil due to ageing. In this research, we aim to improve the dielectric strength of used transformer oil by dispersing ceramic nanoparticles into it. Ceramic materials Ceria (CeO2) and Zirconia (ZrO2) were chosen for their superior dielectric properties and very good thermal conductivity. CeO2 and ZrO2 nanoparticles were synthesized using sol-gel method and incorporated into the oil, experimental results show a substantial improvement in breakdown voltage (BDV), with a 38.88% increase for 0.5 wt% CeO2 and a 16.66% increase for 0.5 wt% ZrO2. This enhancement in BDV of insulation oil reduces insulation failures, lowers the frequency of oil replacement and enhances both the loading capacity and lifespan of transformer.

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