

高压技术

纳米改性变压器油 - 纸复合绝缘频率响应特性

刘君, 周利军, 吴广宁

西南交通大学电气工程学院

摘要:

为寻求提高变压器油纸复合绝缘特性可能途径, 开展了纳米改性变压器油 - 纸复合绝缘频率响应特性研究。利用电介质频率响应法, 对比测试了添加纳米改性前后油纸复合绝缘不同微水含量、在不同温度条件下, 10-4~106 Hz范围频率响应; 建立基于Cole-Cole函数的弛豫模型分析实验结果, 并通过最小二乘法拟合得到弛豫模型参数; 分析不同微水含量及温度条件下添加纳米粒子对弛豫参数的影响。结果表明: 所建立的弛豫模型能较好地反映油纸复合绝缘频率响应特性, 弛豫模型参数能反映油纸复合绝缘状态的变化规律; 添加纳米粒子引入了新弛豫机制, 在低频及高频段, 降低了油纸复合绝缘的介质损耗, 在0.1~100 Hz频率范围内却增大了其介质损耗, 且随着温度升高及微水含量增加, 影响越显著。

关键词: 频率响应 油纸复合绝缘 Cole-Cole模型 纳米改性 复介电常数

Dielectric Frequency Response of Oil-paper Composite Insulation Modified by Nanoparticles

LIU Jun, ZHOU Lijun, WU Guangning

College of Electrical Engineering, Southwest Jiaotong University

Abstract:

The research on dielectric frequency response of oil-paper composite insulation modified by nanoparticles was carried out in order to seek possible way to improve insulation properties thereof. The dielectric frequency responses of oil-paper composite insulation at different temperatures and moisture contents were measured before and after nanoparticles were added within the frequency range about 10-4~106 Hz. The Cole-Cole relaxation models were established to analyze the results. And the parameters of the Cole-Cole relaxation models were obtained by least squares fitting. Then the influences of nanoparticles addition at different temperatures and moisture contents on the relaxation parameters were discussed. The results show that the established relaxation models can reflect well the dielectric frequency response of oil-paper composite insulation and the variation rules of insulation state can be indicated by the parameters of relaxation models. A new relaxation mechanism is introduced by adding nanoparticles, thus the dielectric loss of oil-paper composite insulation modified by nanoparticles is reduced within low and high frequency ranges, while the dielectric loss is increased within the frequency range of 0.1~100 Hz. And the influence is increased along with the increase of temperature and moisture content.

Keywords: dielectric frequency response oil-paper composite insulation Cole-Cole model nanoparticles modification complex dielectric coefficient

收稿日期 2010-11-17 修回日期 2011-03-17 网络版发布日期 2011-11-10

DOI:

基金项目:

四川省青年科技基金(2011JQ0009)。

通讯作者: 刘君

作者简介:

作者Email: liu1983jun@126.com

参考文献:

本刊中的类似文章

1. 陈耀军 钟炎平. 基于合成矢量的电压型PWM整流器电流控制研究[J]. 中国电机工程学报, 2006,26(2): 143-148
2. 董慧芬 周元钧 沈颂华. 双通道无刷直流电动机容错动态性能分析[J]. 中国电机工程学报, 2007,27(21): 89-94
3. 张恒旭 刘玉田. 电力系统动态频率响应时空分布特征量化描述[J]. 中国电机工程学报, 2009,29(7): 64-70
4. 李常刚 刘玉田 张恒旭 庄佩沁 曹路 黄志龙. 基于直流潮流的电力系统频率响应分析方法[J]. 中国电机工程学报, 2009,29(34): 36-41
5. 丁剑 邱跃丰 孙华东 周汉成 马世英 王筑 申洪 李波 宋云亭. 大规模风电接入下风电机组切机措施研究[J]. 中国电机工程学报, 2011,31(19): 25-36
6. 钱江波 韩中合 张美凤. 汽轮机内湿蒸汽两相流介电性质研究[J]. 中国电机工程学报, 2011,31(32): 100-106

扩展功能

本文信息

- Supporting info
- PDF(986KB)
- [HTML全文]
- 参考文献[PDF]
- 参考文献

服务与反馈

- 把本文推荐给朋友
- 加入我的书架
- 加入引用管理器
- 引用本文
- Email Alert
- 文章反馈
- 浏览反馈信息

本文关键词相关文章

- 频率响应
- 油纸复合绝缘
- Cole-Cole模型
- 纳米改性
- 复介电常数

本文作者相关文章

- 刘君
- 吴广宁
- 周利军

PubMed

- Article by Liu,j
- Article by Wu,A.N
- Article by Zhou,L.J

