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## Corrosive Sulphur in Transformers

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The failure of many power transformers have been linked to the presence of an additive, Dibenzyl disulphide (DBDS) in transformer oil. The additive degrades the insulation system of the transformer resulting in untimely breakdown. Most studies have focused on laboratory oil testing, however, the interaction between DBDS and the copper windings of the transformer are still not fully understood. We present experimental results that were obtained from monitoring DBDS formation by varying the temperature of an active oil-filled transformer. It was observed that at high temperatures, the DBDS concentration reached equilibrium. The activation energy for the DBDS reacting with copper and the formation of copper sulphide was determined. It was established that a significant amount of the initial concentration of DBDS was needed in order to react with copper. The interaction of DBDS with the copper surface of the windings was also modelled using density functional theory (DFT). The most stable interaction configuration was determined by comparing different adsorption energies. This configuration was the starting point for further DFT analysis. The respective interacting molecule/additive and surface was optimized to allow maximum interaction between the additive and the surface. These results are compared to our experimental results.

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Dr. Mervlyn Moodley, University of KwaZulu-Natal, Moodleym2@ukzn.ac.za

**Primary authors:** Dr MOODLEY, Mervlyn (School of Physics, University of KwaZulu-Natal); Ms NAICKER, Sharlene-Asia (University of KwaZulu-Natal)

**Presenter:** Ms NAICKER, Sharlene-Asia (University of KwaZulu-Natal)

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