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COMPOSITE MATERIAL CONTAMINATION OF ELECTRICAL EQUIPMENT

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Summary: This paper investigates some of the influences on electrical equipment that might be caused by air borne carbon fibers and carbon nano tubes (CNT) in the production environment. Electrical experiments were performed on 10 V electrical polarities. It is clear that material contamination can create short circuits in low voltage equipment. Only small amounts of network material contamination across polarities are needed to create a short circuit, in the worst case scenario. Carbon fiber volume fractions as low as 0.10, can potentially cause this problem. An important thermal ageing mechanism has been confirmed, which can generate short circuits after some operational time.

ELECTRICAL CONDUCTIVITY

The effects of carbon fiber and CNT contamination on electrical equipment is investigated. This paper studies:

- Some industrial experience from electrical short circuits.
- Carbon fiber electrical conductivity and some corresponding material models.
- The percolation threshold, when a material network structure is created, as quantified by viscosity measurements.
- The percolation threshold, when a material network structure is created, as quantified by electrical conductivity measurements. Studied materials are carbon/epoxy machining dust, 0.06 mm, 0.1 mm, 3.0 mm and continuous carbon fibers. The influence of fiber content, thermal ageing and humidity is studied. Local temperature, generated electrical power and electrical conductivity is measured. Some correlations to expected CNT contamination behaviour is made.
- A simplified hypothesis has been created for how these materials might principally interact with electrical systems. It might explain some of the phenomena observed in industrial usage.

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