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Electrical breakdown in the transformer oil layer above the water layer

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The dynamics of electrical breakdown through the interface of two liquids with different electrical conductivity and different permittivity: a layer of transformer oil over a layer of water in a pulsed electric field directed normal to the interface is experimentally investigated. It was found that at first, under the influence of an electric field, the water surface begins to bend into the oil layer, then a cone-shaped instability of the liquid interface develops and the water cone is quickly drawn into the oil near a high-voltage electrode immersed in oil. The oil layer at the electrode becomes thin, or the water cone reaches the electrode, resulting in a breakdown.

Keywords: electrical breakdown, water, transformer oil, fluid boundary instability.

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