



"Suppliers of Ferrofluids for Research and Industry"

## Ferrofluids for Loudspeaker Applications

### Ferrofluids

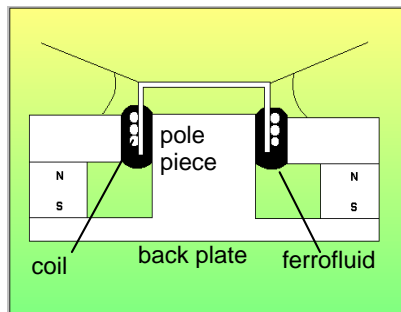
Ferrofluids are stable colloidal dispersions of single domain magnetic particles, typically 100Å in diameter. The particles are usually Fe<sub>3</sub>O<sub>4</sub> (magnetite) and are held in suspension by the use of dispersing agents which are compatible with both the carrier fluid and the magnetic particles. The carrier fluid is usually a synthetic oil.

### Role of a Ferrofluid in a Loudspeaker System

A ferrofluid plays three roles when incorporated into a loudspeaker;

- (i) It conducts heat away from the voice coil
- (ii) It keeps the voice coil concentric with the magnet
- (iii) It is used as a medium for damping.

Much of the energy that is fed into a loudspeaker is wasted as heat. In order to dissipate some of the heat, heat sinks can be used. The heat generated by the voice coil will be partly transferred to the top plate of the speaker and the rest by air convection and conduction, which is not a very efficient process. The build up of heat within the voice coil causes it to expand and can lead ultimately to speaker failure. This expansion will cause the voice coil to scrape the top plate of the loudspeaker. By immersing the coil in ferrofluid, heat is conducted away from the coil much faster, improving the efficiency, and reducing the likelihood



of speaker failure. The magnetic component of the ferrofluid prevents the fluid from leaking away from the air gap, whilst the carrier fluid acts as the medium for heat conduction.

In order to ensure that the fluid remains within the region of the air gap, it is necessary to produce a fluid which is stable. Liquids Research Limited produce loudspeaker fluids of very high colloidal stability, which ensures that the ferrofluid will function correctly during the life-time of the speaker.

Liquids Research Limited manufacture ferrofluids for the entire range of loudspeakers, ranging from tweeters to woofers. All fluids are designed to operate up to 175°C, though to ensure high performance, operation of the loudspeaker at this temperature for a prolonged period of time should be avoided. All loudspeaker ferrofluids are manufactured from high quality synthetic oils and come in a wide range of viscosity and magnetisation. For an extensive list please refer to our catalogue.

## **Health and Safety**

Ferrofluids are not classed as hazardous materials. Normal industrial health and safety procedures should be practised when handling any ferrofluid. Rubber or latex gloves and goggles should be worn. In case of contact with skin the affected area should be washed with mild soap and water. In case of eye contact, the eyes should be flushed with plenty of clean water for 15 minutes. All our ferrofluids are supplied with a safety sheet.

For further information please contact our technical department at the address below.

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