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Preparation of Magnetic Ferrofluids in Alternative Carrier Liquids

Ferrofluids can be made by prolonged grinding of particles of magnetic material such as magnetite or ferrite, together with a polar-surfactant and a nonpolar solvent. The surfactant is adsorbed on the surface of the submicron particles and acts as a coupling agent between the particles and the solvent in which the particles are dispersed.

Magnetic particles in a ferrofluid remain in suspension under the influence of applied magnetic fields because the submicron particle size allows particle motion to be maintained by thermal agitation, and the surfactant keeps the particles far enough apart to overcome the force of attraction caused by Van der Waals forces.

A method for substituting one ferrofluid solvent for another is available. The introduction of a polar flocculating solvent into the ferrofluid causes the particles with adsorbed surfactants to come out of suspension. This solvent reduces forces opposing the Van der Waals forces so that the particles are attracted to one another and Waals separate from solution. Shrinkage of the thickness of the surfactant coating enables the Van der Waals forces to bring and keep adjacent particles together. Alternatively, the solvent can act to link particles, causing flocculation and

ultimately the separation of particles and solvent. Resuspension of the particles in another solvent completes the process.

The invention provides a means for formulating ferrofluids containing solvents that are not suitable as grinding or manufacturing aids, and for altering the particle concentration in a ferrofluid.

Note:

Related background information on ferrofluids may be found in Patent No. 3,281,403 and in an article entitled "Magnetic Fluids" by R. E. Rosensweig, in the July 1966 issue of International Science and Technology.

Patent status:

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act [42 U.S.C. 2457 (f)], to AVCO Applied Technology Division, Lowell Industrial Park, Lowell, Massachusetts 01851.

Source: R. E. Rosensweig of
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