

Microemulsion

Technology Offer

Non-hazardous Microemulsion – an Alternative to Solvent Based Cleaners
(see attachment 1)

Department & Inventor

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Patents

Several patents, some already granted, some nationalized. One application was made recently with nationalization in April 2014.

Existing Licenses

First contract signed with a company for coating additives and printing chemicals. Microemulsion was supposed to be used as printing machine cleaner; however, market entry did not take place, because of the high cost pressure in the printing industry. Second contract was signed with a company for wood varnishes. The market launch for the product, a brush cleaner, is planned in mid-2013.

Market

The microemulsion is a commercially interesting and highly competitive alternative to conventional solvent-based cleaners which are harmful and hazardous to the environment and human health. The market experts from Ceresana, one of the most trusted market research institutes for the industry, expect overall worldwide solvent consumption to increase at an average annual rate of 2.5% over the next years. They forecast the global solvent market to earn revenues of about US\$33 billion in 2019. Especially the dynamic economic development in emerging markets like China, India, Brazil or Russia will continue to boost demand for solvents. The market for solvents is considerably influenced by legal regulations and the growing environmental awareness of end-consumers. Changes targeted at reducing the environmental impact of solvents will focus on both production methods and further substitutions of specific solvent types. The microemulsion-based cleaner developed at Forschungszentrum Jülich allows to meet both technical requirements and changing market demands.

Developmental Status

Offered is a chemical formulation. Proof of concept has been demonstrated and a prototype solution is available. There are a variety of possible applications conceivable. What exactly the microemulsion is used for results mostly from further development of the industrial partner. The Forschungszentrum Jülich is open to collaborations for further research and development. Licensing terms constitute the usual standards and are negotiated individually.

Additional Information upon Request

- Presentation on microemulsion for industry partners
- Patent list

Contact

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Non-hazardous Microemulsion – an Alternative to Solvent Based Cleaners

Innovation

Scientists at the Forschungszentrum Jülich in Germany developed a microemulsion containing a special admixture and hence only very low amounts of surfactants. The big advantage of the microemulsion is that it does not have to be labeled. The microemulsion could be of interest for B-to-C and/or to B-to-B activities. It could be used as solvent-free brush cleaner in the Do-it-Yourself sector or in cosmetics. In the B-to-B field it could be used for cleaning industrial parts or as cutting and grinding fluid or hydraulic fluid.

Technology

Microemulsions are composed of two in principle immiscible liquids, usually water and oil, and one emulsifier preventing phase separation (surfactant). In contrast to normal emulsions microemulsions do not demulsify to their components, i.e. remain thermodynamically stable and appear to be transparent. The right choice of oils and surfactants has an effect on temperature stability and microstructures. At Forschungszentrum Jülich scientists were successful in formulating a microemulsion free of labeling. The patented microemulsion contains a special polymer allowing a considerably reduced content of surfactants (“booster”).

Features

- Removes water-based paint, varnishes, adhesives, silicone, acrylic sealant
- Removes dirt on surfaces originating from resin and/or fat as well as stains from fabrics
- Substitutes solvent based cleaners for example used for cleaning industrial parts, in household (e.g. baking oven cleaner) and in cosmetics
- Not subject to labeling, not poisonous, not harmful to health, odorless
- Stable over a wide temperature range (32°F-113°F and more)
- Flash point >212°F
- In essence devoid of volatile organic compounds (VOCs), permitting considerable time to react without the danger of evaporation of the emulsion
- Low water pollution class providing advantages for transport and storage
- Does not dehydrate but leaves a pleasant feeling on the skin
- Economical formulation because water is the main component
- Vegetable oil based and biodegradable
- Composition may be modified and adjusted to new fields of application, use of other oils and surfactants may lead to different features

Development status

The microemulsion can be used everywhere where solvents are common today, for example for removing non-water-soluble remains and impurities (e.g. paint, adhesives). It is an interesting alternative to conventional solvent-containing cleaners which are harmful to the environment and health.



Fig.1: Brush cleaner test with an off-the-shelf brush cleaner, containing large amounts of volatile solvents (photo 3, left) and a cleaner based on the microemulsion developed at the Forschungszentrum Jülich (photo 3, right).

Patents

European patent EP 1937795, filed on September 15, 2006, granted on June 01, 2011.

European patent application EP 2253698, filed on September 15, 2006.

Other patent applications, also in the United States, are in preparation.

Application

- Cleaning of industrial parts in fields still using solvents today (e.g. circuit boards, nozzles, stainless steel cannulas, automobile industry etc.)
- Hydraulic oils, e.g. in fields requiring rigid fire protection (mining) or special environmental requirements (forestry)
- Grinding and/or cutting fluids

Next Steps

Forschungszentrum Jülich is interested in licensing and/or R&D cooperation.

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