

The high adsorption capacity and affinity of SORBSIL® silica hydrogels for polar impurities make them ideally suited for use in a range of triglyceride and fatty acid processing industries in addition to edible oil refining, notably

- Biodiesel Production
- Rapeseed/Canola oil fuel
- Oleochemical Industry
- Oil & Fat Purification

# In biofuels and other applications

## SORBSIL® Silicas

### Biodiesel production

Biodiesel is produced by the reaction between a triglyceride oil or fat with methanol to form the fatty acid methyl ester (biodiesel) and glycerol by-product. SORBSIL® silica hydrogel can be used in the pre-treatment of the oil or fat feedstock, prior to the transesterification reaction, for the removal of soaps, phospholipids and trace metals in order to enhance the quality of the feedstock.

The availability and cost of feedstock are significant factors in the economics of biodiesel production. As the price of refined bleached deodorised (RBD) oil for example increases, the biodiesel producer's profitability decreases. The use of SORBSIL® silica hydrogel for the adsorption of impurities from the oil or fat allows lower cost feedstocks to be processed.

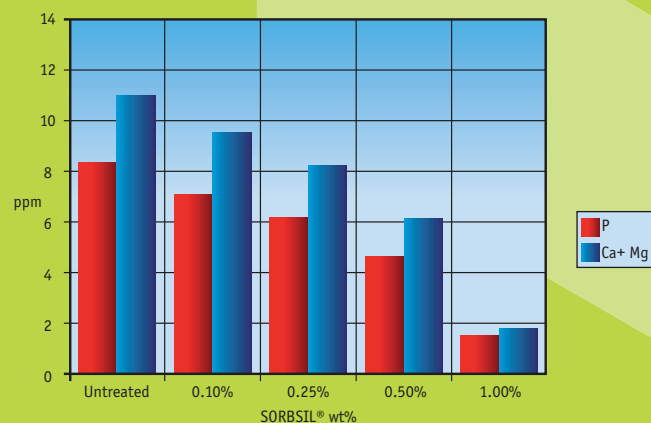
Many large-scale biodiesel producers are back integrated into feedstock refining and are therefore able to switch between feedstocks to process the lowest cost, most available material at any time. The use of SORBSIL® silica hydrogel is beneficial in that it facilitates this flexible approach, and provides a means of ensuring that consistently high quality oil or fat is available for transesterification.

Contaminants such as soap and phospholipids result in higher catalyst consumption, which can be very costly. They also result in the formation of emulsions which make separation from the glycerol by-product difficult and thereby reduce yield. Also, other impurities in the feedstock such as trace metals may also have an adverse effect on biodiesel properties.

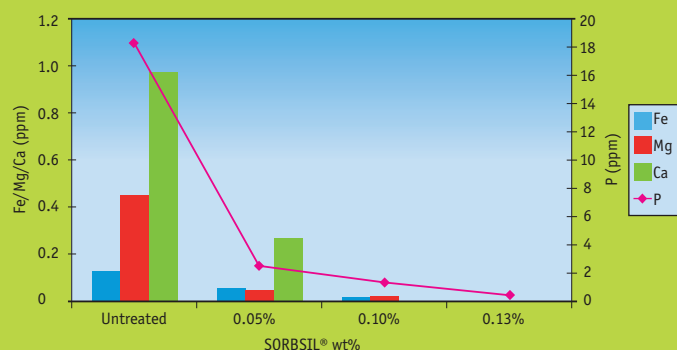
SORBSIL® silica hydrogel may be used in the biodiesel industry for the treatment of oils and fats in much the same way as for edible oil refining, although in contrast, no bleaching clay is necessary as colour removal is not required. Therefore, after neutralisation and separation of most of the soap with a centrifuge, the oil can then simply be treated with silica adsorbent to produce a feedstock suitable

for biodiesel production. Alternatively if the feedstock is physically refined, SORBSIL® silica hydrogel can be used to remove phospholipids and trace metals to produce good quality feedstock.

The reduction in impurities resulting from treatment with SORBSIL® silica hydrogel is illustrated for rapeseed oil (P, Ca + Mg) and soybean oil (P, Fe, Ca, Mg) in Figures 1 and 2 respectively.



**Figure 1:** Treatment of Rapeseed oil @ 40°C with SORBSIL® silica hydrogel



**Figure 2:** Treatment of Soybean oil @ 85°C with SORBSIL® silica hydrogel

The ever increasing move to more stringent fuel specifications, e.g., phosphorus, will place extra demands on the biodiesel producer. The use of SORBSIL® silica hydrogel will assist the producer in meeting these demands in a cost effective way. Oxidative stability is also of growing importance. The removal of traces of iron from the feedstock using SORBSIL® silica hydrogel will potentially improve the oxidative stability of the biodiesel.

SORBSIL® silica hydrogel may also be used post-transesterification. The biodiesel from the reaction may contain traces of unreacted methanol, monoglycerides, diglycerides and moisture. Also, if a sodium methoxide homogeneous catalyst is used, the product will contain sodium soaps. SORBSIL® silica hydrogel can be used to assist in the removal of some of these impurities from the biodiesel.

In the production of **Renewable or 'Green' diesel**, SORBSIL® silica hydrogel may be used to 'clean up' vegetable oil feedstock prior to hydrotreatment. This is applicable to various feedstock types including palm oil, rapeseed oil, sunflower oil and soybean oil. In this way, levels of phosphorus and trace metals are effectively reduced which may be beneficial in prolonging catalyst life.

## Rapeseed/Canola oil fuel

The use of rapeseed/canola oil as a biofuel is an attractive alternative to biodiesel produced by chemical modification of vegetable oil, and an important substitute for fossil fuels. Due to the higher viscosity of rapeseed/canola oil fuel, engine modification is required to enable the fuel to be used. In addition, fuel from rapeseed/canola oil has to meet increasingly demanding national quality standards, in particular with respect to reducing phosphorus, calcium and magnesium levels. The use of SORBSIL® R40 silica hydrogel within the process offers a highly effective means of achieving these demanding targets.

## Oleochemical industry

The capacity of silica hydrogel to adsorb trace metals from oils and fats has found application in the oleochemical industry for the removal of residual catalyst metals after esterification and hydrogenation reactions. The undesired heavy metals can be present in particulate, colloidal or soluble form. SORBSIL® silica hydrogel has been shown to be effective in the removal of tin and zinc catalyst residues following the esterification of fatty acids.

## Oil & fat purification

Crude oils and fats obtained after rendering, crushing or solvent extraction unavoidably contain various amounts of fatty acids, mono- and diglycerides, phospholipids, sterols, tocopherols, hydrocarbons, pigments, vitamins, sterol glucosides, protein fragments and traces of heavy metals. Some of these compounds are highly undesirable and need to be removed to obtain an oil or fat with the desired quality. The affinity of SORBSIL® silica hydrogel for polar impurities provides a means improving the quality of oils and fats in a cost effective manner.

PQ Corporation's philosophy is to work in conjunction with our customers to establish the most suitable grade and dosage recommendation of SORBSIL® silica hydrogel for their application.

For further assistance, please contact us via e-mail: [techsupport@pqcorp.com](mailto:techsupport@pqcorp.com)

[www.pqcorp.com](http://www.pqcorp.com)

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