Regeneration of spent catalyst has also been examined, but no suitable solvent or method was found to remove the catalytic poisons from the catalyst surface. However, after treating spent catalyst with palladium-containing compounds, the activity may be restored to its original value and several further hydrogenations can be achieved. Impregnation of the supports with palladium-containing compounds can be repeated many times. Finally, spent catalyst with a high palladium content is formed from which palladium can be extracted and reused in fresh catalyst.

Increasing the Oil Decontamination Index

Hydrogenations performed under mild conditions (120–140°C) over the palladium-based catalyst form almost no undesirable secondary products by the thermal decomposition of oils and fats; free fatty acids do not form and the final produce of "white hydrogenated fat" does not require additional refining and deodorisation, which is essential in conventional technologies.

However, in order to ensure that the palladium consumption is low, the initial preparation of the vegetable oils prior to hydrogenation needs to be improved, as palladium is very sensitive to catalyst poisons. We have found that the purification stages should remain the same, namely: alkali refining, washing, drying and deodorisation, but the purity of the refined vegetable oils must be higher and free of certain compounds, especially those containing sulfur. If the refined oil is purer, the cost of the palladium and its contribution to the cost of the final product will be less.

Conclusions

A new highly selective catalyst containing small amounts of palladium has been developed for the hydrogenation of vegetable oils. The main principles of the hydrogenation process have been worked out and new highly efficient and cost effective technology, using the catalyst, has been successfully tested for the production of pure edible margarines. Together, the new catalyst and novel reactor design are able to achieve the full-scale production of margarines.

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Acoustic Catalysis in Palladium

Acoustic excitation applied to thin noble metal films on single crystals enhances the catalytic reactions occurring over these surfaces (1).

Now work in Japan has described the different kinetic behaviours on the two faces of a single $LiNbO_3$ crystal covered with a thin Pd film during ethanol oxidation using resonant acoustic oscillations (RO) (2). RO causes an anomalous increase in catalytic activity. Activation energy falls from 156 to 36 kJ mol^{-1} on the positively polarised, (+)Pd, surface, and to zero on the negatively polarised Pd surface. Oxygen is strongly adsorbed on the (+)Pd surface.

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