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# World Biodiesel Congress & Expo

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## The factors affecting the stability of biodiesel

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According to raising demand and study of biodiesel, I have undertaken studies on stability of biodiesel from tree borne non-edible and edible oil seeds. European biodiesel standard EN-14214 calls for determining oxidation stability at 110$^0$C with a minimum induction time of 6 h by the Rancimat method (EN-14112). Research was conducted to investigate influence of presence of transition metals, likely to be present in the metallurgy of storage tanks and barrels, on oxidation stability of biodiesel and influence of other factors like light and darkness. It was found that influence of metal was detrimental to oxidation stability and catalytic. Even small concentrations of metal contaminants showed nearly same influence on oxidation stability as large amounts. Copper showed strongest detrimental and catalytic effect. The dependence of the oxidation stability on the type of metal showed that the biodiesel storage should be very careful. The effect of light and darkness was also compared.

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## Nanostructured materials as biofuel catalysts

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Recent progress in the synthesis of novel structures and preparation of zeolite nano-crystals and hierarchical materials stimulated developments in many areas, including nanostructured catalysts, advanced coatings, flexible films and membranes for medicine, sensor applications, etc. Biodiesel is a renewable fuel that can be manufactured from oil crops, animal fats, or recycled oil. It contains oxygen and is sulphur-free making it a cleaner burning fuel than petrol and diesel with reduced emissions of SOx, CO, unburnt hydrocarbons and particulate matter. Commercial biodiesel is produced from renewable resources including canola, sunflower or soya bean oil, which are composed of C14–C20 fatty acid triglycerides, via esterification and transesterification processes. Esterification occurs when carboxylic acids react with alcohol in the presence of a catalytic amount of mineral acids yielding esters. Transesterification can be performed using homogeneous basic catalysts including sodium and potassium hydroxides, carbonates or alkoxides. However, the removal of the base after the reaction is a major problem since aqueous quenching results in the formation of stable emulsions and saponification, making separation of the methyl ester difficult. The use of a heterogeneous basic or acidic catalyst offers several advantages including the elimination of the quenching step, and associated contaminated water waste, to isolate the products, and the opportunity to operate in a continuous process. In this project, we aim to investigate the potential of composite materials combining base-modified high silica zeolites, such as beta (BEA) and ZSM-5(MFI), and titanosilicates, e.g. ETS-10, targeting the catalytic production of the second generation bio-diesel. Utilising their organophilic-hydrophobic surface properties and changing the acid-base behaviour of these multifunctional catalysts may provide a new approach towards managing the transesterification and esterification reaction in one-pot. Our work is focused on the preparation and modification of nanostructured catalysts, making use of the structure promoters. Both catalytic testing and characterisation of these materials using a wide range of techniques (FTIR, XRD, NMR, GC-MS, adsorption studies, etc.) would inform the preparation conditions in order to improve the overall catalytic performance. Furthermore, reaction testing using microwave heating as a highly efficient energy consumption technology is compared with the traditional reaction systems utilising conventional heating.

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