

## ENZYMATIC SYNTHESIS OF SURFACTANTS

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### Introduction

The syntheses of these speciality products using enzymes are non-toxic and environmentally friendly, green processes. Mild conditions are energy saving, that also minimise the occurrence of off-colours and degradation by-products during reaction.

Fatty aminoesters are used as raw materials for producing biodegradable surfactants, fabric softeners, emulsifiers and washing up liquid. A technique was developed for the synthesis of fatty esteramines at low temperature and ambient pressure using enzyme as the catalyst (Zainab Idris, 1998).

### Materials and Methods

Esterification: Triethanolamine (0.7mmole) and oleic acid (0.7mmole) were mixed with 2ml hexane and 40 mg lipase and reacted at 40°C with shaking at 200 rpm in a closed vial for 4 h. Reaction was terminated by separation of enzyme

from reaction mixture by filtration. Solvent was removed by rotary evaporation. Analysis of products: Presence of products was visualised on TLC using 95% chloroform and 5% methanol as the solvent system. Further analysis was carried out on the Shimadzu 8A gas chromatograph using an RTX capillary column.

### Results and Discussion

The reactivity and specificity of many types of lipases were also screened, with Lipozyme showing the highest conversion. Using oleic acid as a substrate a total conversion of between 50 to 60% could be achieved. Optimisation of reaction parameters such as temperature, time of reaction and stirring rate could increase the rate of conversion. Mono-, di- and triethanolamines may be produced enzymatically indicated by TLC and FTIR analysis. The three products can be resolved by gas chromatography and the amount of each type of monoesters produced quantified. By changing the substrate ratio and time of reaction, the composition of the products can be tailored. Similar products can be obtained using triglycerides as a substrate.

### Conclusions

An enzymic method for the synthesis of fatty ester amines has been developed. The reaction can be carried out under mild conditions and by changing certain reaction parameters, the composition of products can be manipulated.

### References

Zainab Idris. 1998. Enzyme catalysed synthesis of fatty aminoesters from esterification of fatty acids and triethanolamine. MS Thesis, Universiti Putra Malaysia.