National University of Lesotho

2nd Africa-EU Renewable Energy Research and Innovation Symposium (RERIS)
NULISTICE 2018

RECP Africa-EU Renewable Energy Cooperation Programme

Parametric sensitivity in sunflower oil ethanolysis using Shea nut shell based catalyst

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Problem statement 1/2

The fossil fuel resources are shortening day by day

Increase of energy demand especially for transport

Impacts on global warming

Find locally sustainable and renewable alternatives to fossil fuels

Biofuels

Biodiesel

(Dejean et al, 2017)

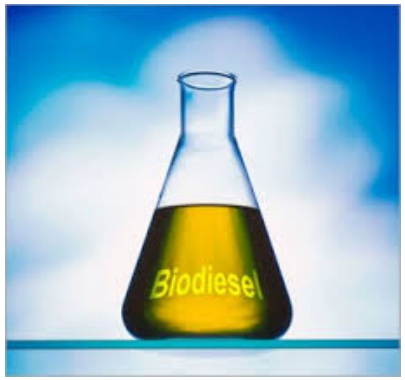
Problem statement 2/2

Current research for biodiesel production is mainly focused on heterogeneous catalysts

Vegetable oil

+ Bioethanol

Carbon based Catalyst



Ethylic biodiesel

+ Glycerol

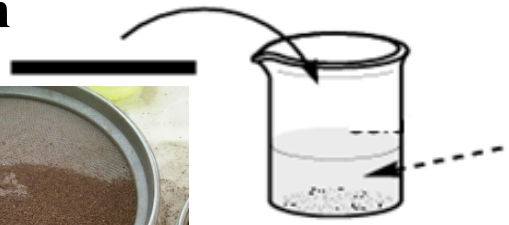
Bioethanol can be produced with local renewable raw material and be used for transesterification reaction instead of methanol which present the disadvantages of being fossil origin, expensive, non-renewable and producing greenhouse gas.

Main goal : Local green and low cost transesterification process through the use of new original catalyst from activated carbon of biomass residue for ethylic transesterification which are:

- **Simple to produce**
- **Can be used under mild conditions**
- **Green and cost-effective process at small-scale level**

Methodology 1/2

1) SNS ground to 400 - 800 µm

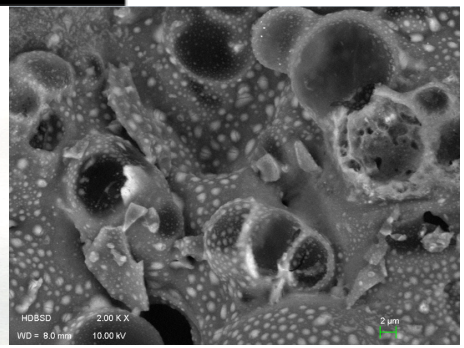


2) Impregnation with potassium hydroxide (KOH)

Impregnation during 24h + drying in an oven at 105°C

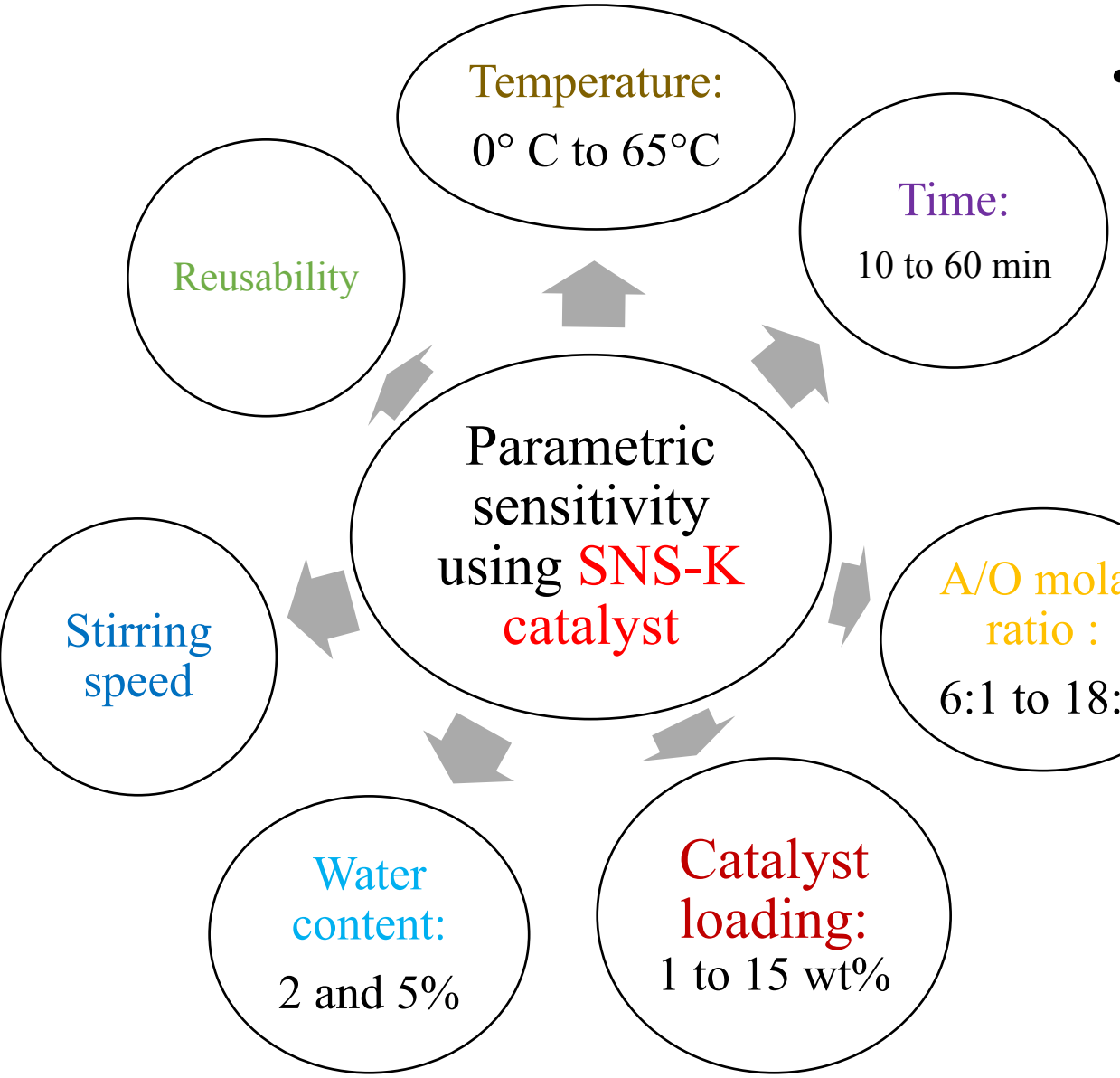
3)Pyrolysis and activation under N_2

Catalytic actives sites dispersed the catalyst



SNS-K Catalyst

Methodology 2/2



- Commercial Sunflower oil (acid value: 0.2 mg KOH/g)
- 99.8% anhydrous ethanol (Sigma Aldrich)

were used as reagents

Characterizations were done by:

- GC-FID
- ICP/OES
- XRD
- FTIR
- SEM
- EDX

Conclusion

With the optimal and highly stable catalyst prepared at a pyrolysis temperature of around 650 °C, 120 min pyrolysis residence time and a KOH to SNS ratio of 14 wt%, a conversion yield of 98% was obtained,

1- Optimized reaction conditions were found to be : 30 °C reaction temperature, 30 min reaction time, an ethanol to oil molar ratio of 12:1, a catalyst loading of 10 wt% (oil weight basis) and a stirring speed of 650 rpm,

2- The catalyst lost activity when water was present in the ethanol, conversion yield decreased to respectively 86% and 72% at 2% and 5% ethanol water content,

3- The catalyst was used 3 times and catalyst activity was still 76% at the third run after catalyst regeneration by thermal treatment,

4- XDR and FTIR characterizations reveal that the catalytic activity was linked to the development of active species of K_2CO_3.

Shea Nut Shell (SNS) catalyst can be considered as a promising catalyst candidate for a cost effective production of local ethylic biodiesel.

Acknowledgements

Thank you for your attention!!

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