

## A simpler and highly efficient protocol for the preparation of biodiesel from soap stock oil using BBSA catalyst

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-: Supporting information:-

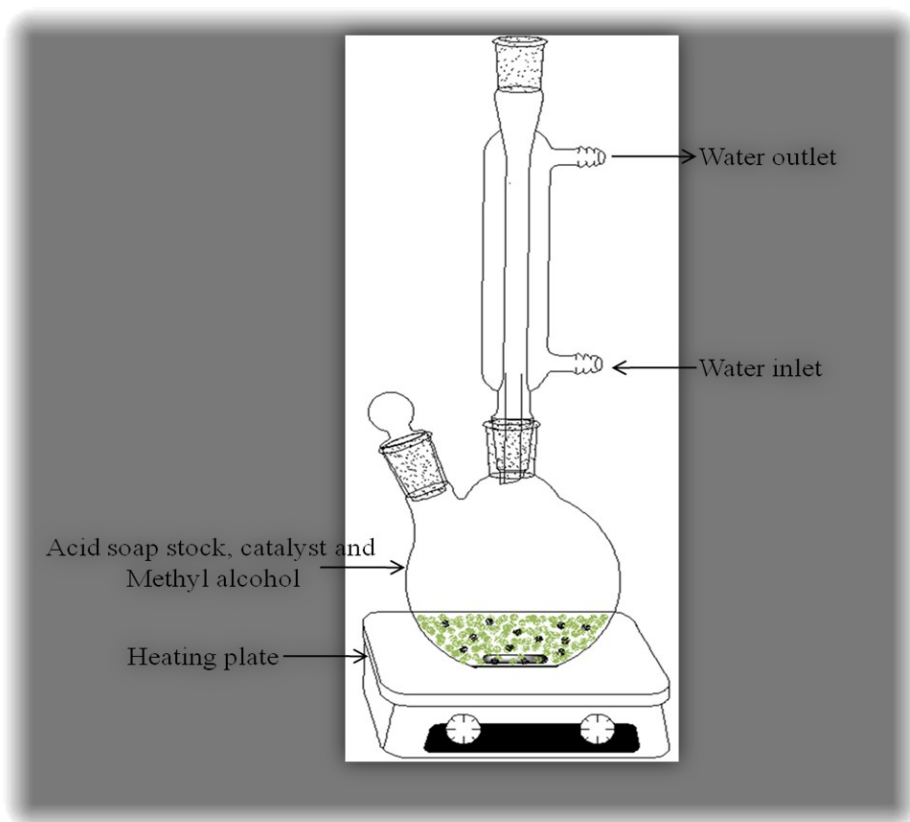
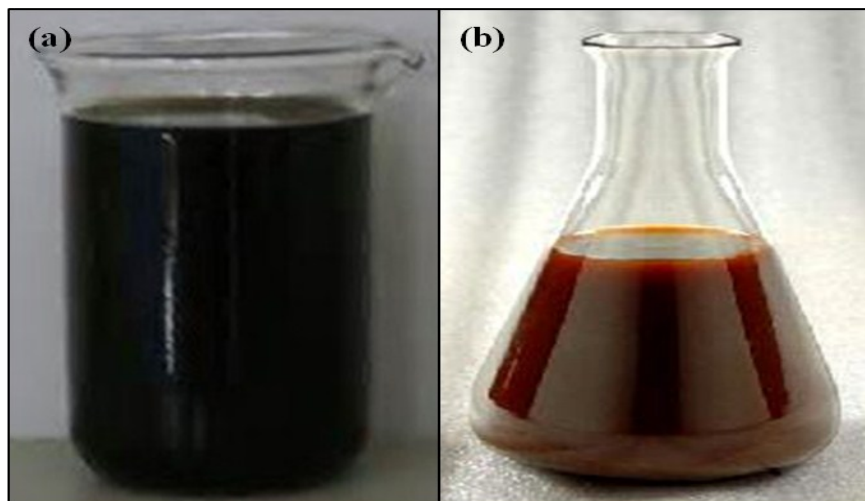
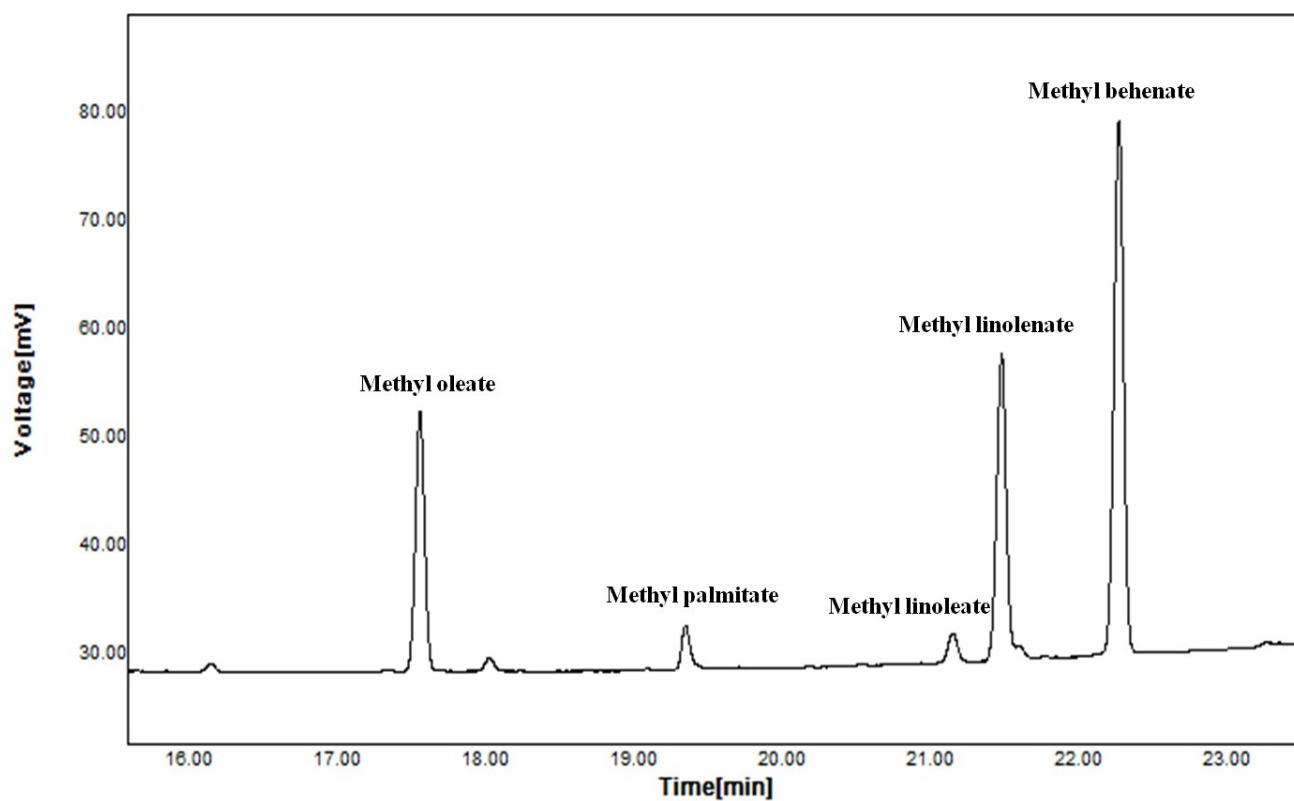


Figure S1. Reaction assembly for production of biodiesel from soap stock oil



**Figure S2. (a) Stock oil and (b) Soap stock biodiesel**



**Figure S3. GC-FID chromatogram of soap stock biodiesel**

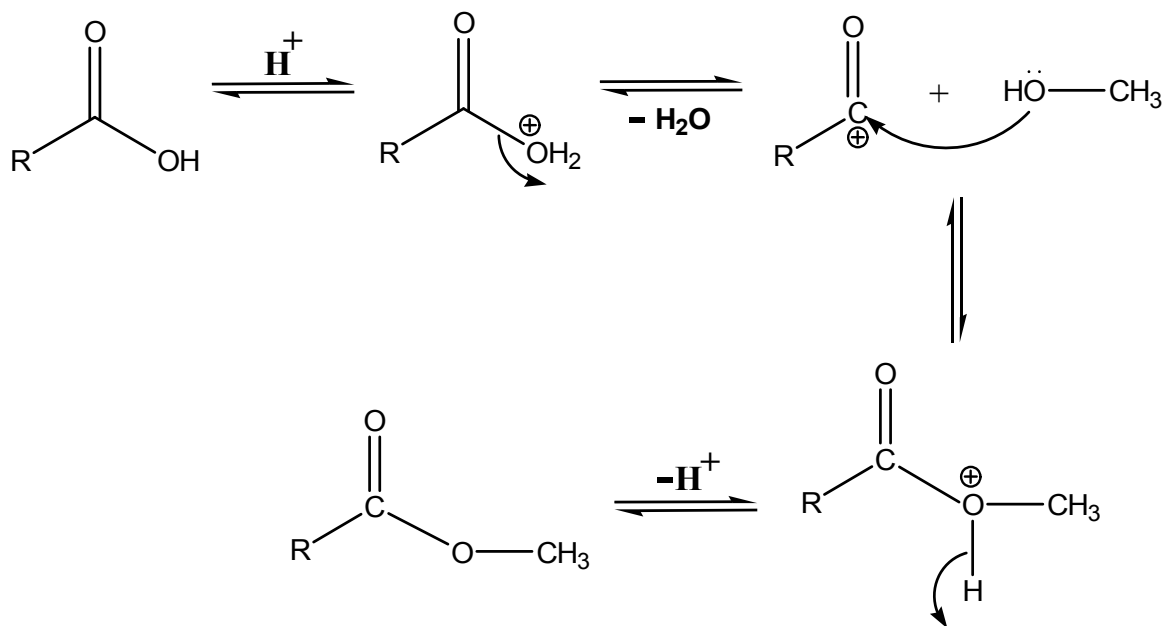


Figure S4. Proposed mechanism for esterification of free fatty acid to biodiesel

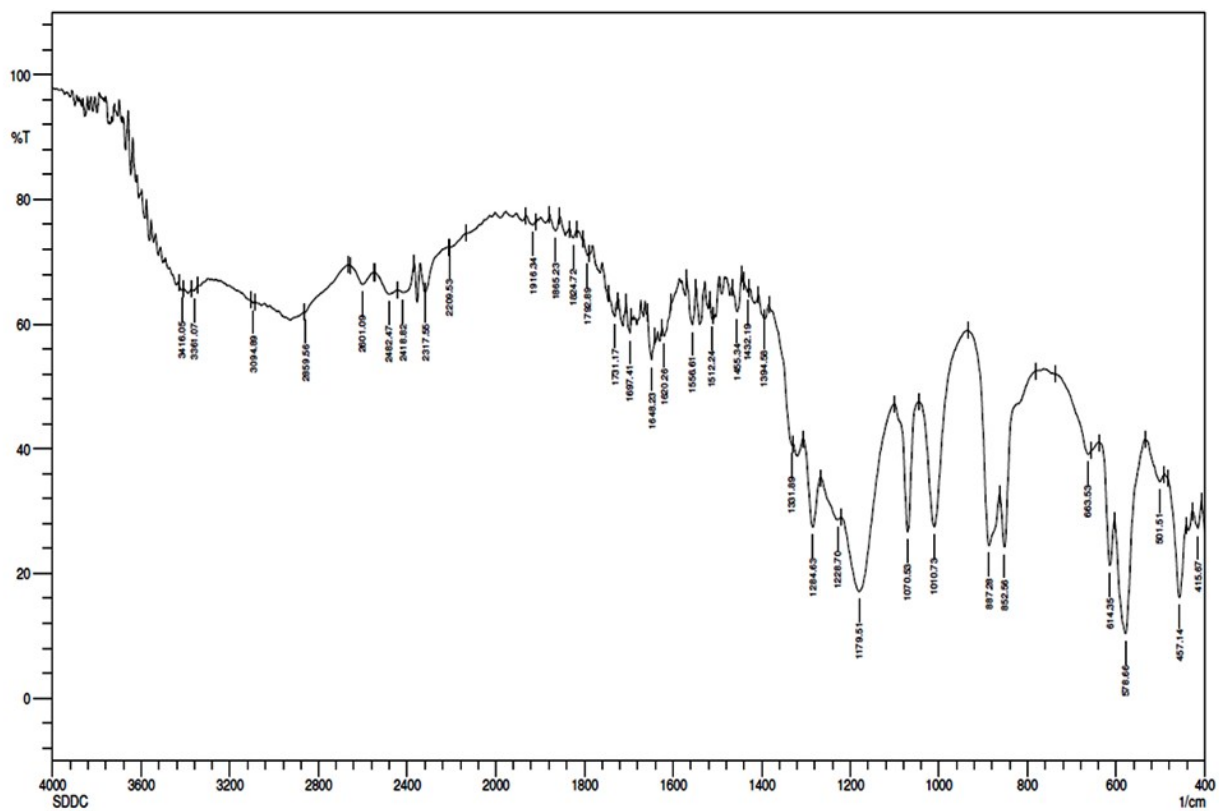
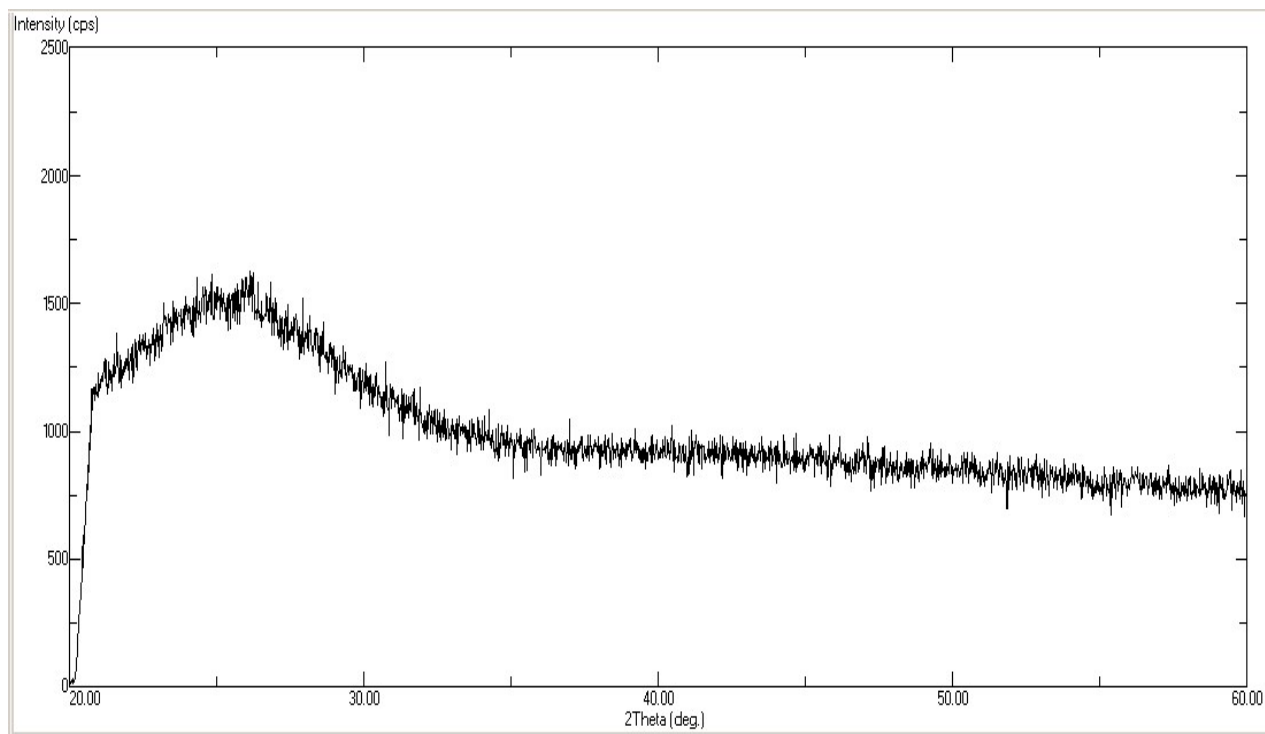
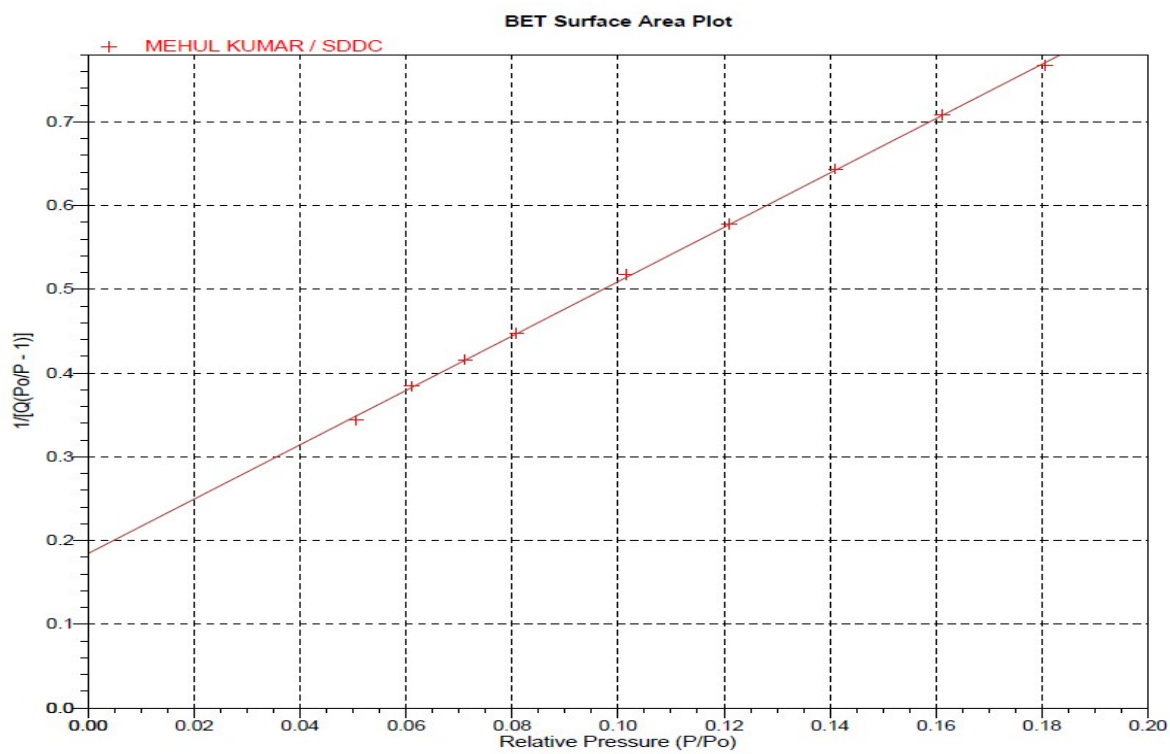


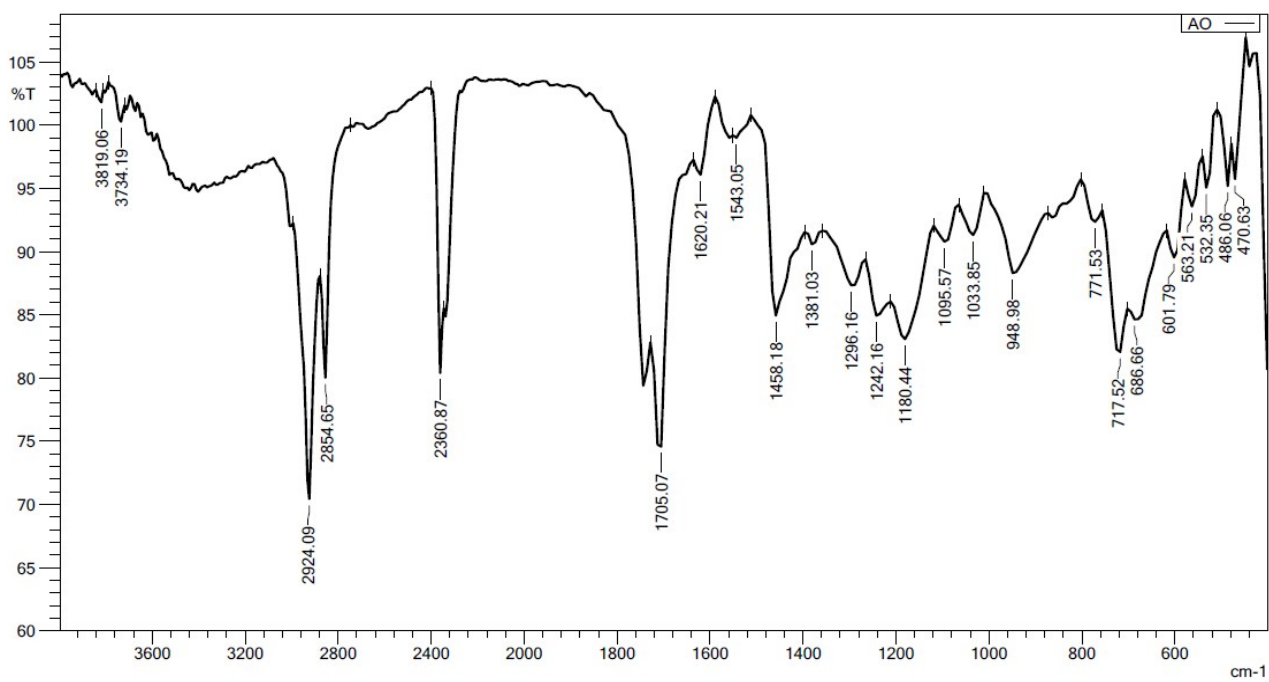
Figure S5. FT-IR spectrum of BBSA catalyst



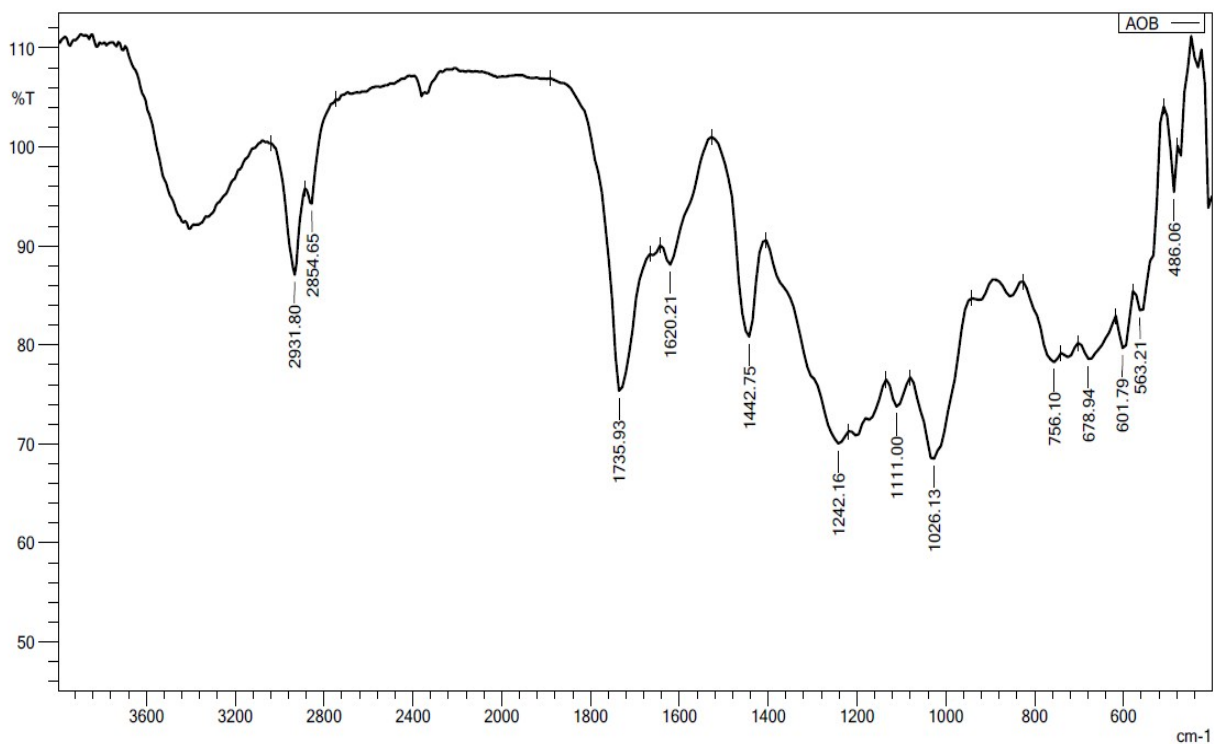
**Figure S6. X-ray diffractogram of BBSA**



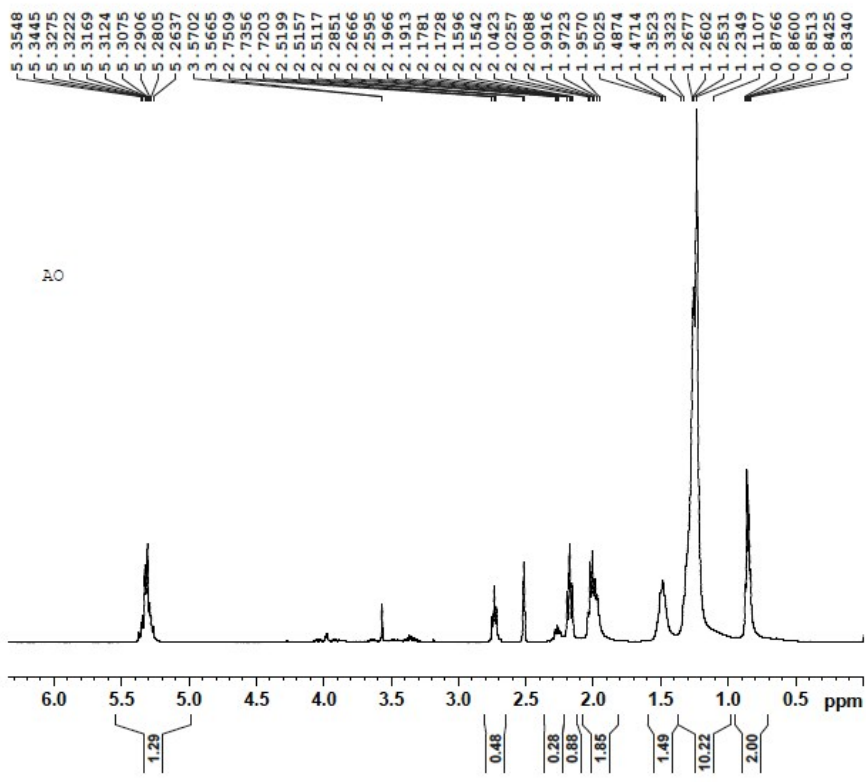
**Figure S7. BET isotherm of BBSA catalyst**



**Figure S8. FT-IR spectrum of soap stock oil**



**Figure S9. FT-IR spectrum of soap stock biodiesel**

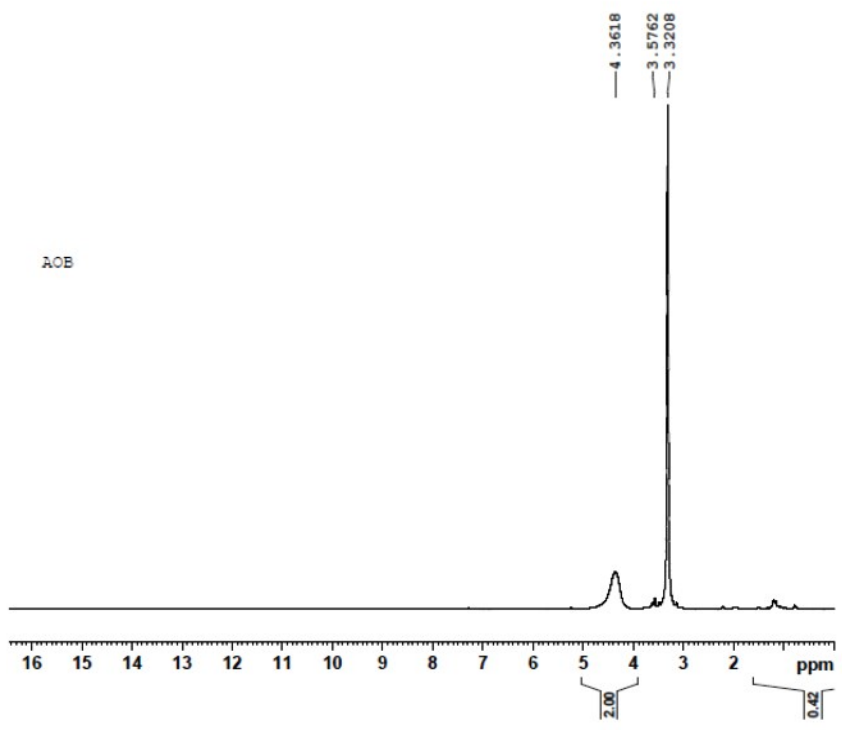


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EXPNO         1
PROCNO        1
Date_         20150411
Time          16.59
INSTRUM       spect
PROBHD        5 mm BBO BB-1H
FULPROG       zg30
TD            65536
SOLVENT       DMSO
NS            16
DS            2
SWH           8223.695 Hz
FIDRES        0.125483 Hz
AQ            3.9846397 sec
RG            32
DW            60.800 usec
DE            6.50 usec
TE            300.0 K
D1            1.00000000 sec
TDO           1

===== CHANNEL f1 =====
NUC1          1H
P1            14.10 usec
PL1           0.00 dB
PL1W          8.31494441 W
SFOL          400.1324710 MHz
SI            32768
SF            400.1299978 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
  
```

Figure S10. <sup>1</sup>H NMR spectrum of soap stock oil



```

NAME          MK-AOB
EXPNO         1
PROCNO        1
Date_         20150411
Time          16.59
INSTRUM       spect
PROBHD        5 mm BBO BB-1H
FULPROG       zg30
TD            65536
SOLVENT       CDCl3
NS            16
DS            2
SWH           8223.695 Hz
FIDRES        0.125483 Hz
AQ            3.9846397 sec
RG            16
DW            60.800 usec
DE            6.50 usec
TE            300.0 K
D1            1.00000000 sec
TDO           1

===== CHANNEL f1 =====
NUC1          1H
P1            14.10 usec
PL1           0.00 dB
PL1W          8.31494441 W
SFOL          400.1324710 MHz
SI            32768
SF            400.1300000 MHz
WDW           EM
SSB           0
LB            0.30 Hz
GB            0
PC            1.00
  
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Figure S11. <sup>1</sup>H NMR spectrum of synthesized soap stock biodiesel

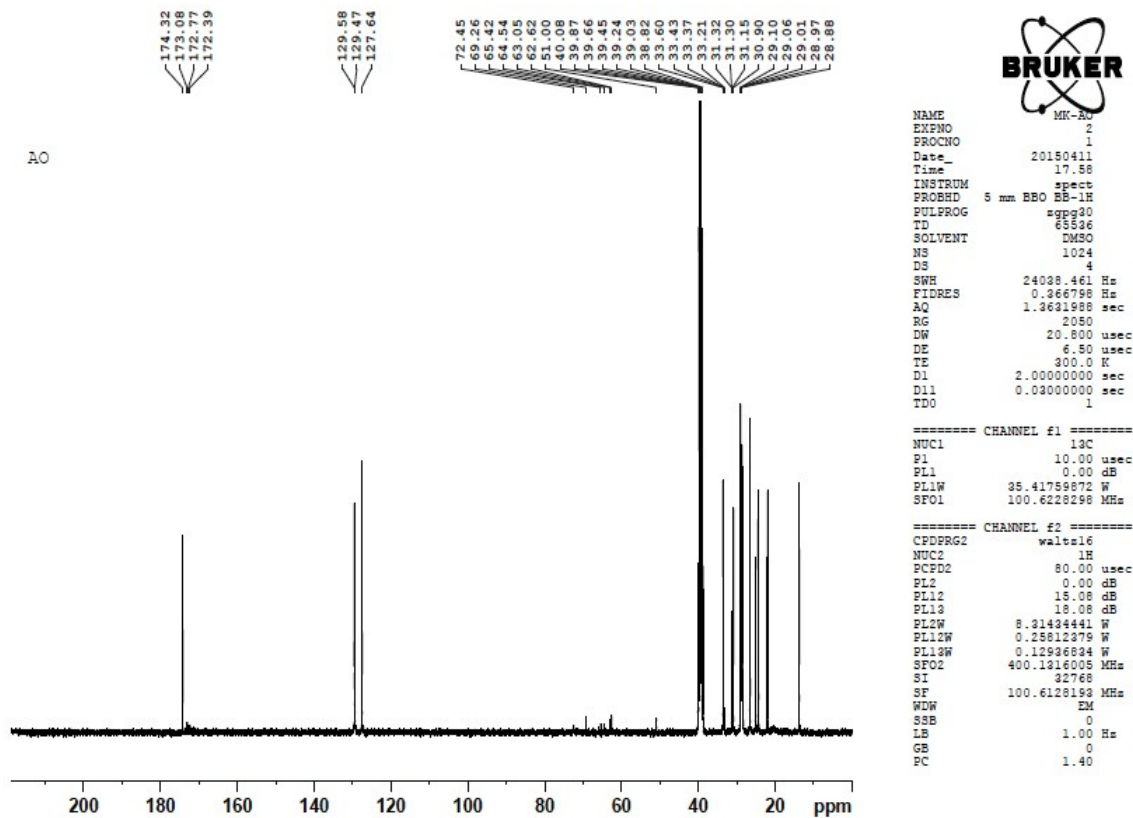


Figure S12. <sup>13</sup>C NMR spectrum of soap stock oil

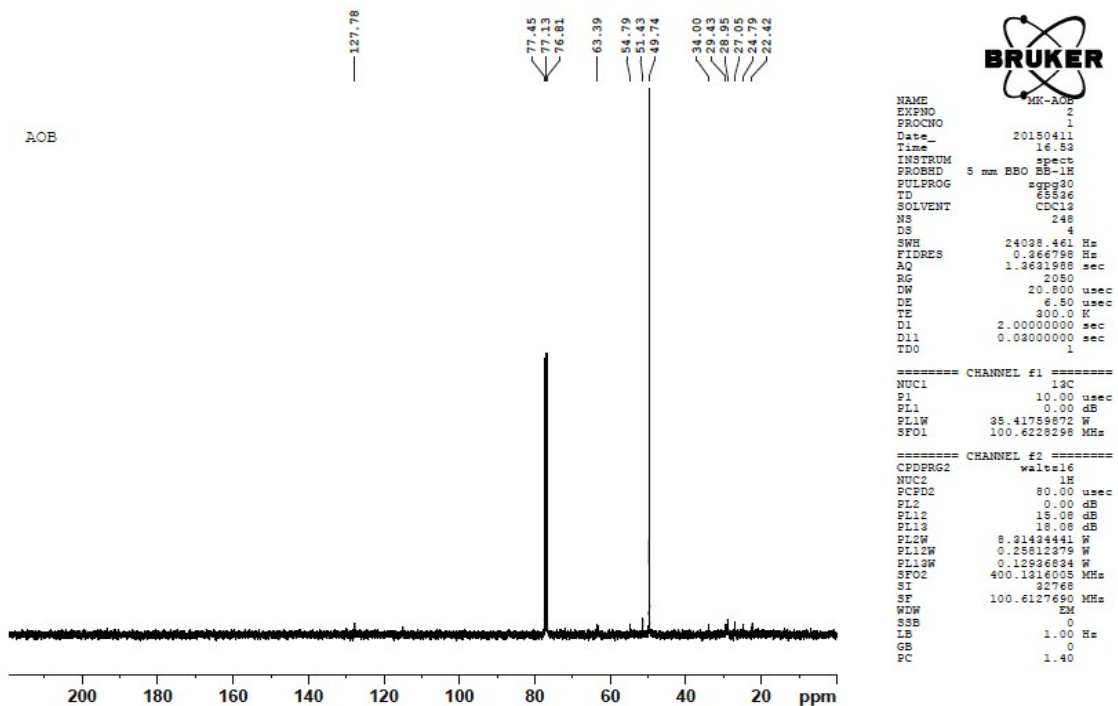


Figure S13. <sup>13</sup>C NMR spectrum of synthesized soap stock biodiesel