**Supplementary**

**F1****. Flow chart for the ANN modeling for TSOME production**

**F2. Levenberg−Marquardt backpropagation**

**F3. Fuzzy Inference System architecture**



**F1. Flow chart for the ANN modeling for TSOME production**



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**T1. Authentication test**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Experiment | (min) | M:TSO | (wt.%) | (%) | (%) | (%) | % Error wrt. RSM | % Error wrt HM |
| 1 | 77.6 | 5.99/1 | 1.10 | 90.11 | 90.17 | 90.15 | 0.066 | 0.044 |
|  |  |  |  |  |  |  |  |  |

Tr= reaction time (min); M:TSO = Methanol/tobacco seed oil; Ca = catalyst amount (wt.%); Ey =Experimental yield (%); PYRSM =RSM predicted yield (%); PYHM = hybrid model predicted yield (%); % error wrt. RSM model = % error of RSM model with respect to Ey; % error wrt. RSM model = % error of hybrid models with respect to Ey

**T2. Properties of TSOME produced**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Property** | **Unit** | **B0** | **TSOME produced** | **ASTM Standard D6751-02** | **EU Standard**  **EN14214** |
| Density; 15 °C | kg/m3 | 850 | 891.10 | NS | 860 – 900 |
| Kinematic viscosity; 40 °C | mm2/s | 3.61 | 3.87 | 1.9 - 6.0 | 3.5 – 5.0 |
| Flash point | °C | 75 | 126 | 130 min | 120 min |
| Lower heating value (MJ/kg) |  | 43.78 | 42.53 | - | - |