# HETEROGENEOUS CATALYSTS FOR BIODIESEL PREPARATION BASED ON NANOSIZED PLASMA PROCESSED ALUMINA

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Nowadays biodiesel production processes have been widely studied in laboratory and on an industrial scale with the purpose of decreasing the final cost of the desired product. In the biodiesel industry, the most widely used catalysts are alkali (NaOH, KOH and $NaOCH_3$). These catalysts provide high efficiency in transesterification reactions, as they are of a homogeneous nature and are soluble in alcohols. However, homogeneous alkaline catalysts have one major drawback – the regeneration for reuse in biodiesel production process isn't possible. Therefore the use of heterogeneous catalysts as an alternative for the transesterification reaction in biodiesel production could enable the development of a non-waste technology with a beneficial economic effect. This abstract summarizes the results of the rapeseed oil methanolysis process using various heterogeneous catalysts that are supported on plasma processed alumina nanopowder porous granules with a specific surface area of 50 $m^2/g$ (see Table 1).

Table 1

| Catalyst | Catalyst preparation | Characteristics | RME yield, % |
|---|---|---|---|
| Methanolysis reaction conditions in autoclave: 150 $^oC$, 3 h, methanol/oil=9.5, catalyst - 2 wt % | | | |
| $SrO/Al_2O_3$ | The porous granules of alumina impregnated with the aqueous solution of $Sr(OH)_2$ and dried at 120 °C for 24 h | Content of SrO - 8 wt. % | 12.4 |
| $MoO_3/Al_2O_3$ | The porous granules of alumina impregnated with the ammonium molibdate aqueous solution and dried and calcined at 650 °C for 6 h | Content of $MoO_3$ - 16 wt. %, specific surface area = 18 $m^2/g$ | 13.9 |
| Methanolysis reaction conditions in atmospheric pressure: 65 $^oC$, 8 h, methanol/oil=8.25, catalyst - 5 wt % | | | |
| $MgO/Al_2O_3$ -granules | MgO precipitated on the surface porous granules of alumina by urea and dried at 100 °C for 12 h | Content of MgO - 54 wt.% | 6.1 |
| $MgO/Al_2O_3$ nanopowder | MgO precipitated on the surface of alumina nanopowder by urea and dried at 100 °C for 12 h | Content of MgO – 54 wt.% | 1.5 |
| $SrO/Al_2O_3$ - 700 | The porous granules of alumina impregnated with the aqueous solution of $Sr(NO_3)_2$ | Calcined at 700 °C for 1 h, content of SrO=35 wt.% | 0.0 |
| $SrO/Al_2O_3$ - 750 | | Calcined at 750 °C for 1 h, content of SrO=20 wt.% | 0.0 |
| $Na_3PO_4/Al_2O_3$-1 | The porous granules of alumina impregnated with the aqueous solution of $Na_3PO_4$ and dried at 150 °C for 24 h | Content of $Na_3PO_4$=24 wt. % | 69.4 |
| $Na_3PO_4/Al_2O_3$-2 | | Content of $Na_3PO_4$=7 wt. % | 35.0 |

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