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SYNTHESIS OF FATTY ACID 2-PROPYL AND 2-OCTYL ESTERS FROM RAPESEED OR PALM OIL

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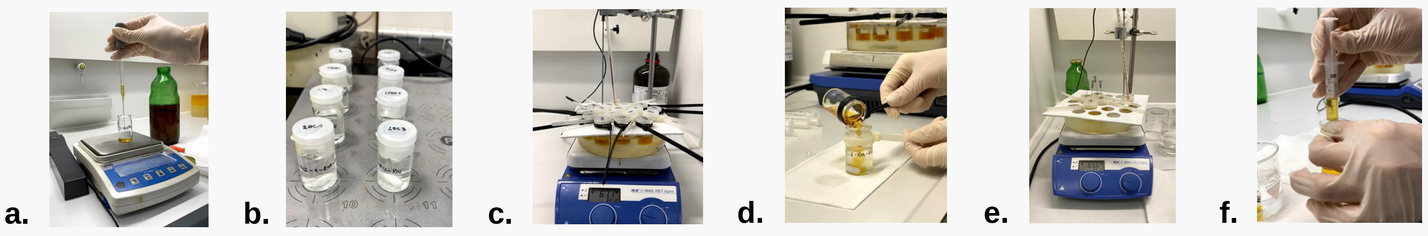
INTRODUCTION

Biodiesel, i.e. fatty acid alkyl esters, is a sustainable, nontoxic, and biodegradable fuel alternative synthesized via catalyzed transesterification of vegetable oils or animal fats, with an alcohol (most commonly methanol or ethanol). In this research, the selected feedstock, rapeseed or palm oil, was transesterified with a selected secondary alcohol (2-propanol or 2-octanol) in the presence of different catalysts (potassium hydroxide or sulfuric acid) into fatty acid alkyl esters. The reaction temperature was kept constant (60 °C), as well as the mixing speed (150 rpm), while the mass fraction of the catalyst (1 or 3 %), the molar ratio of the reactants (20:1 or 30:1) and the reaction time (20, 40, 60 min, 1 or 7 days) varied during the experiments.

EXPERIMENTAL



a. Weighing the reactants/catalyst
b. Desolving the catalyst in alcohol
c. Preheating the reactants
d. Mixing the reactants at the set temperature
e. Biodiesel synthesis at the set temperature
f. Reaction termination after a period of time, and sampling for NMR analysis

Figure 1. Experimental procedure

RESULTS

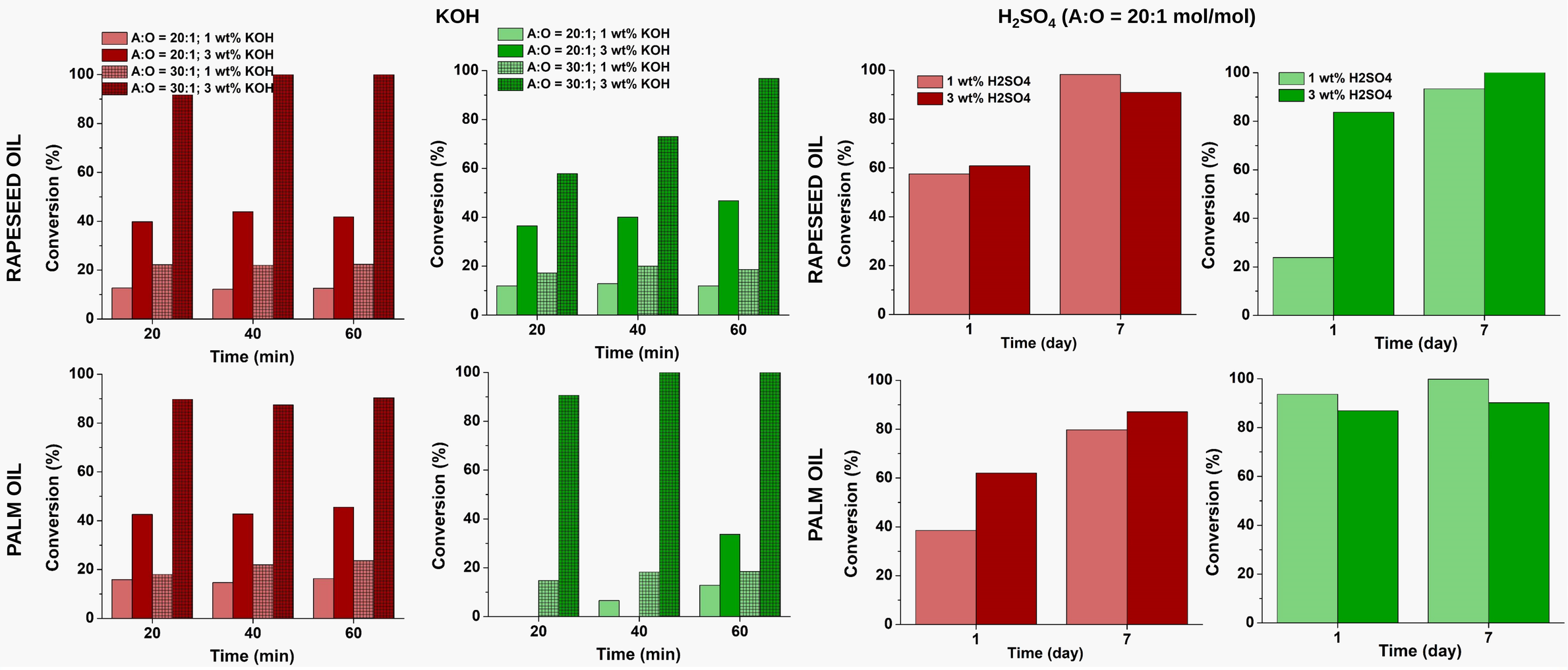


Figure 2. The influence of the reaction time, molar ratio of the reactants, and the mass fraction of the catalyst on the seleceted synthesis of fatty acid 2-propyl, and 2-octyl esters

CONCLUSIONS

- **In all reaction systems, satisfactory conversions set by the standard HRN EN 14214 (above 96.5 %) were successfully achieved. However, the time requiered is much shorter when using potassium hydroxide, as a catalyst, than in the case of sulfuric acid.**
- **When using potassium hydroxide as a catalyst in the biodiesel synthesis, the increase in the molar ratio of the reactants from 20:1 to 30:1 in all systems results in the increase in the reaction conversion.**
- **The increase in the mass fraction of the catalyst generally results in the increase in the reaction conversion, with the exception of the systems [rapeseed oil + 2-propanol + H_2SO_4 (7 days)]; and [palm oil + 2-octanol + H_2SO_4 (1, and 7 days)], where the presence of sulfuric acid might have led to the oxidation of biodiesel.**
- **The influence of time on the reaction conversion is more pronounced when using sulfuric acid as a catalyst, in comparison to potassium hydroxide, where it was only noticeable in the system [rapeseed oil + 2-octanol + KOH (A:O = 30:1, 3 wt% KOH)].**

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