Recyclisable efficiency of different catalysts in organic reactions under microwave irradiations

RAVINDER SINGH*, MUKEISH RANI, SUMITA RANI and SUMEDHA MALIK

Department of Chemistry, Government P.G. College, Bahadurgarh - 124 507 (India)

(Received: February 12, 2007; Accepted: May 03, 2007)

ABSTRACT

The different catalysts like Mont. K-10 clay, Mont. KSF clay, Yb (OTf)₃, Sc(OTf)₃, Dy (OTf)₃, Gd (OTf)₃, and InCl₃ can be recycled many times without loss of catalytic activity during the synthesis of tetrahydrophytopyrin under microwave irradiation.

Key words: Mont. K-10, microwave, recyclisable.

INTRODUCTION

In recent year, one of the prime concerns of the chemists is search for alternate method or technologies to increase the product yield decrease the reaction times, increase the selectivity and use of environmentally benign reactants or catalyst. In view of this, we report our results on the application of MW-assisted reactions. Microwave technology in chemical reaction is first used in 1986. The microwave oven has been used increasingly by chemists to provide the activation energy for chemical reactions, especially in the field of organic chemistry. We now demonstrate the recyclable efficiency of Mont. K-10 clay, Mont. KSF clay, Yb (OTf)₃, Sc(OTf)₃, Dy (OTf)₃, Gd (OTf)₃, and InCl₃ during the synthesis of tetraphenylporphyrin under microwave irradiations.

The work was initiated by investigating the reaction in between benzaldehyde and pyrrole in the presence of K-10 clay catalyst under microwave irradiation at 560wW to give 30% yield(TLC monitoring). The catalyst K-10 could be reused 5-times without any loss of catalytic activity. Similarly, the same reaction is carried out in the presence of different catalyst i.e. Mont. KSF Yb (OTf)₃, Sc(OTf)₃,

Table - 1: Recyclisable efficiency of different catalysts using synthesis of tetraphenylporphyrin

<table>
<thead>
<tr>
<th>S No.</th>
<th>Catalyst</th>
<th>Yield at different times of usage of catalyst</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mont. K-10 clay</td>
<td>30  30  30  30  30</td>
</tr>
<tr>
<td>2.</td>
<td>Mont. KSF clay,</td>
<td>29  29  29  29  29</td>
</tr>
<tr>
<td>3.</td>
<td>Yb (OTf)₃</td>
<td>26  26  26  26  26</td>
</tr>
<tr>
<td>4.</td>
<td>Sc(OTf)₃</td>
<td>23  23  23  23  23</td>
</tr>
<tr>
<td>5.</td>
<td>Dy (OTf)₃</td>
<td>20  20  20  20  20</td>
</tr>
<tr>
<td>6.</td>
<td>Gd (OTf)₃</td>
<td>16  16  16  16  16</td>
</tr>
<tr>
<td>7.</td>
<td>InCl₃</td>
<td>28  28  28  28  28</td>
</tr>
</tbody>
</table>
Dy (OTf)$_3$, Gd (OTf)$_3$, and InCl$_3$ and the yield remains same even when these catalyst could be reused 5-times. This clearly indicates that these catalysts are quite stable upon microwave irradiation (Table -1).

**EXPERIMENTAL**

In a typical procedure, benzaldehyde (1m mole), pyrrole (5m mole) and catalysts (1g) was taken in an Erlenmeyer flask (100ml) and ir-radiated at 560W power level in an unmodified domestic microwave oven operating at 2450 MHz. After cooling to room temperature, the crude product was extracted and recrystallised with ethanol to yield pure TPP. The product was identified on the basis of their IR, $^1$H-NMR and by comparison of their Rf values with those of authentic samples prepared by standard routes.

**CONCLUSION**

We have shown that the catalytic activity of the different catalysts like Mont K-10. Mont. KSF remains same during their recycling even for 5 times under microwave ir-radition.

**ACKNOWLEDGEMENT**

We thank Dr. R. Sharma (Dayton) for gifts of Mont. K-10 and Mont. KSF clay.

**REFERENCES**