Photolysis Kinetics of Propisochlor in Water

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Abstract: Propisochlor in water was irradiated at room temperature by a 400 W high pressure mercury lamp and sunlight, respectively. Influence of light and initiative concentration of propisochlor on the photolysis were studied. The results showed that under the irradiation of sunlight the photolysis fitted first order kinetics with only 5.5% degradation after one hour's irradiation in the quartz tube, that was a slow rate; while under the irradiation of high pressure mercury lamp the photolysis can be described by a double-chamber model, in which the degradation rate can reach 80.9% after 1 h. The higher the initiative concentration of propisochlor was, the slower the photolysis rate became, and the photolysis of propisochlor was influenced by the increasing photoproducts. The six main photodegradation products were identified using GC-MS method. The aromatic ring was proved to be intact during the process. And the photolysis mechanism was then assumed on the basis of the photoproducts detected.

Keywords: herbicide; propisochlor; photolysis; mechanism of reaction; Beynon Table

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**Note:** The text appears to be a page from a scientific journal, discussing the photolysis kinetics of Propisochlor in water. The abstract outlines the experimental setup and findings, while the keywords indicate the main areas of focus in the study.
1. 1

1. 2

1. 3

1. 4

Fig. 1 The reactor of photolysis

Fig. 2 The sketch map of photolysis experiment under the sun

1) 250 mL, 50 mL, 10 mL, 3 mL, 0.8 mL

2) 15 m, 60°
\[ \frac{c - c_1}{c} \times 100\% \]
\[ c \]

2.1

2.2

Table 1  The photolysis kinetic formula of propisochlor with different irradiation

<table>
<thead>
<tr>
<th>No.</th>
<th>( c )</th>
<th>( R^2 )</th>
<th>( c_0 )</th>
<th>( c_1 )</th>
<th>( % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>( c = 53.053e^{-0.02081t} )</td>
<td>0.9947</td>
<td>52.81</td>
<td>52.856</td>
<td>0.09</td>
</tr>
<tr>
<td>2</td>
<td>( c = 37.352e^{-1.6081t} )</td>
<td>0.9684</td>
<td>48.23</td>
<td>37.332</td>
<td>22.60</td>
</tr>
<tr>
<td>3</td>
<td>( c = 54.744e^{-1.7806t} )</td>
<td>0.9991 ( t \geq 1.68 )</td>
<td>52.65</td>
<td>9.16</td>
<td></td>
</tr>
</tbody>
</table>

1) \( t = 1.5 \) h, 2) \( t = 2 \) h, 3) \( t = 3 \) h

Fig. 3  The photolysis curve of propisochlor with different irradiation

Fig. 4  Emission spectrum of mercury lamp and the sun
Fig. 5 The photodegradation rate of propoxycarb with different concentration.

Fig. 6 Result of HPLC under sunshine.

Fig. 7 The MS result of photodegradation products under the sunshine.

$M^+ m/z 265$.
31) \(-\text{OH}\) : m/z 77, m/z 91, m/z 65

\[ m/z \text{ 39} \]

\[ m/z \text{ 27} \]

\[ m/z \text{ 19} \]

\[ m/z \text{ 17} \]

\[ m/z \text{ 15} \]

\[ m/z \text{ 13} \]

\[ m/z \text{ 11} \]

\[ m/z \text{ 9} \]

\[ m/z \text{ 7} \]

\[ m/z \text{ 5} \]

\[ m/z \text{ 3} \]

\[ m/z \text{ 1} \]

\[ 2\text{-}\text{O} \cdot \text{N} \cdot (2\text{-}\text{O} \cdot 6\text{-}\text{O}) \cdot \text{N} \cdot (1\text{-}\text{O}) \]

\[ \text{C}_3\text{H}_7\text{NO}_3 \]

\[ (3) \]

\[ \text{M}^+ = 233, 203, 173, 161, 146, 130, 118, 103, 91, 77, 65, 51, 43, 39 \]

\[ \text{M}^+ : (M+1)^+ = 6:1 \]

\[ (4) \]

\[ \text{M}^+ = 219, 195, 160, 147, 132, 119, 105, 91, 77, 73, 65, 51, 43, 39 \]

\[ \text{M}^+ : (M+1)^+ = 17:3 \]

\[ (5) \]

\[ \text{M}^+ = 205, 191, 175, 162, 146, 132, 117, 91, 77, 65, 43, 39 \]

\[ \text{M}^+ : (M+1)^+ = 13:2 \]

\[ (6) \]

\[ \text{M}^+ = 211, 162, 147, 134, 120, 106, 91, 77, 73, 65, 51, 39 \]

\[ \text{M}^+ : (M+2)^+ = 3:1 \]

\[ 2\text{-}\text{CH}_2\text{NO} \cdot \text{N} \cdot (2\text{-}\text{CH}_2\text{NO} \cdot 6\text{-}\text{CH}_2\text{NO}) \cdot \text{N} \cdot (1\text{-}\text{CH}_2\text{NO}) \]

\[ \text{C}_6\text{H}_{12}\text{NO}_2 \]

\[ \text{MS} \] - left column

\[ \text{The MS and assumed result of photolysis products with irradiation of high pressure mercury lamp} \]

\[ \text{Table 2} \]

\[ \text{Fig. 8 Result of HPLC under the mercury lamp} \]

\[ \text{2.3.3} \]

\[ (1) \cdot \text{C} = \text{N} \cdot \text{C} = \text{Cl} \cdot \text{C} = \text{O} \cdot \text{C} = \text{H} \]

\[ \text{2.3.2} \]
Fig. 9 Photolysis mechanism of propisochlor in pure water