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Photoinductive degradation of 17β-estradiol and isoproturon by natural dissolved organic matter under simulated sunlight

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- Pollutants degradation is always faster in the presence of DOM than in purified water.
- Enhancement effect strongly depends on the nature of DOM extracts.
- An order of DOM efficiency is observed :
  - South Platte (69%, E2; 72%, IPU) >> Pinail (41%, E2) > Suwannee (39%, E2; 37%, IPU)

\begin{align*}
\text{Without Inhibitor} \quad \% \text{ E2 degraded after 8 h} & \quad \% \text{ IPU degraded after 8 h} \\
\text{Suwannee} & \quad 10\% \quad 4\% \\
\text{Pinail} & \quad 17\% \quad 14\% \\
\text{Without Na₃} & \quad 6\% \quad 0\% \\
\text{With 2-propanol} & \quad 12\% \quad 19\%
\end{align*}

\begin{align*}
\text{Without Inhibitor} \quad \% \text{ E2 degraded after 8 h} & \quad \% \text{ IPU degraded after 8 h} \\
\text{Suwannee} & \quad 12\% \quad 6\% \\
\text{Pinail} & \quad 19\% \quad 0\% \\
\text{Without Na₃} & \quad 19\% \quad 19\% \\
\text{With 2-propanol} & \quad 0\% \quad 0\%
\end{align*}

\begin{align*}
\text{Pathway of E2} & \quad \text{Pathway of IPU} \\
1: \text{hydroxylation of aromatic cycle or cycle closed to aromatic one} (E21-E24) & \quad 1: \text{demethylation of dimetylurea group (I5)} \\
2: \text{E2 quinone methide derivative (E27)} & \quad 2: \text{hydroxylation of aromatic cycle (I1 and I4)} \\
3: \text{hydroxylation of aromatic cycle and oxidation of phenolic groups (E25 and E26)} & \quad 3: \text{simultaneous demethylation and hydroxylation of isopropyl group (I2 and I3)}
\end{align*}

Conclusions
- DOM presents an ability to photoinduce the degradation of micropollutants; its efficiency depending on the micropollutant and on its own properties (nature of the extract).
- During photoinductive degradation, reactive species such as singlet oxygen and hydroxyl radicals are produced by DOM and react with the pollutants. However, the participation of these 2 molecules has only been observed. Excited triplet states may contribute to a large extent in the reaction.
- Photoproducts have been observed. They come from hydroxylation, oxidation and demethylation/dealkylation mechanisms of the parent compound.