INTRODUCTION

Dioxins & Chlorinated VOCs issue:
Formation of chlorinated VOx and dioxins in all processes of combustion in presence of chlorine or chlorinated compounds
- Municipal and medical waste incineration and Co-combustion unit
- 0.1 g TEQ/Nm³ = 0.1 g PCDD/PCDF

The classical model-VOC approach… & its limits

Select catalysts that are highly active in the total oxidation of aromatic structures

**VOx/TiO2** catalysts are selected

**Improved formulations are proposed after studies on Chlorobenzene**

**However**, a real dioxin also includes an oxygenated moiety, what could be its role in the process?

The classical model-VOC approach… & its limits

Select catalysts that are resistant to chlorine poisoning

**Doping oxides**

**Dioxins & Chlorinated VOCs issue**

Goal of the study

Check the relevance of optimization and evaluation strategies for VOx/TiO2 catalysts with an oxygenated model in addition to the classical Cl-VOC model

RESULTS

**Question 1: Are VOx/TiO2 catalysts efficient in the abatement of O-VOC (FURAN)?**

<table>
<thead>
<tr>
<th>Support Name</th>
<th>Effect on Chlorobenzene abatement</th>
<th>Support effect on Furan abatement</th>
</tr>
</thead>
<tbody>
<tr>
<td>TiO2</td>
<td></td>
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<tr>
<td>VOx/TiO2</td>
<td>Positive effect with Mo or W doping</td>
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<td>VOx/TiO2 /MoOx</td>
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</table>

**Support effect on Chlorobenzene abatement**

$T_{50}$ induced a huge improvement

BECAUSE

- $T_{50}$ better spreading of VOx on the support
- Increase of the amount of Brønsted sites
- Promotion of the adsorption step of Clbz (rate-limiting)
- Higher SSA  & higher V weight loading

**Support effect on Furan abatement**

$T_{50}$ induces a very small improvement

BECAUSE

- Only the textual properties of $T_{50}$ influence the performance
- The increase of Brønsted acidity has no influence because Furan adsorption is not rate-limiting

**Doping oxides**

Positive effect with Mo or W doping

BECAUSE

- Mo and W bring a higher amount of Brønsted sites
- Promotion of the adsorption step of Clbz (Crucial & over-balancing the negative aspects of the presence of Mo and W)

**Huge negative effect with Mo or W doping**

BECAUSE

- The increase of Brønsted acidity has no influence
- Mo and W prevent the complete spreading of V
- Mo and W are bad total oxidation catalysts

**Question 2: Are the so-called "improved catalysts" also better in the oxidation of Furan?**

**Support effect on Chlorobenzene abatement**

$T_{50} = -10^\circ C$

**Doping oxides**

Positive effect with Mo or W doping

BECAUSE

- Mo and W bring a higher amount of Brønsted sites
- Promotion of the adsorption step of Clbz (Crucial & over-balancing the negative aspects of the presence of Mo and W)

**Doping oxides**

Huge negative effect with Mo or W doping

BECAUSE

- The increase of Brønsted acidity has no influence
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**Conclusions**

- VOx/TiO2 catalysts are efficient in the total oxidation of O-VOC like Furan, however, the adsorption behavior of Furan demands an adaptation of the test procedures. After the catalyst has been saturated with the pollutant it is possible to measure the catalytic activity.

- The use of a sulfate-containing TiO2 support is highly beneficial for Chlorobenzene abatement but the effect is very small in the case of Furan because no promotion of the adsorption step is needed in this case.

- The co-impregnation of Mo or W oxide has a positive effect on the performance in Chlorobenzene abatement but brings a deleterious effect on the Furan oxidation efficiency because Furan adsorption is far from rate-limiting while Mo and W diminish VOx exposure.

- A selection of the "best" formulation would lead to very different choices whether it is based on the study of the oxidation of a O-VOC model or a Cl-VOC model. For the ultimate case of the PCDD/F abatement, the relevance of these two approaches should be further checked.