





# Research and Technological Development in a Field of Environmental Control System

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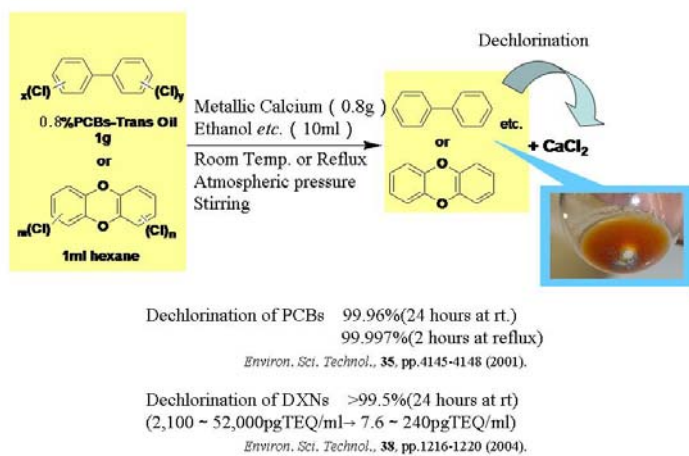


Research Fields : Organic Chemistry, Environmental Analytical Chemistry, Environmental Protection Chemistry.  
Keywords : Dechlorination, Environmental Protection, Green Chemistry

## Research Topics

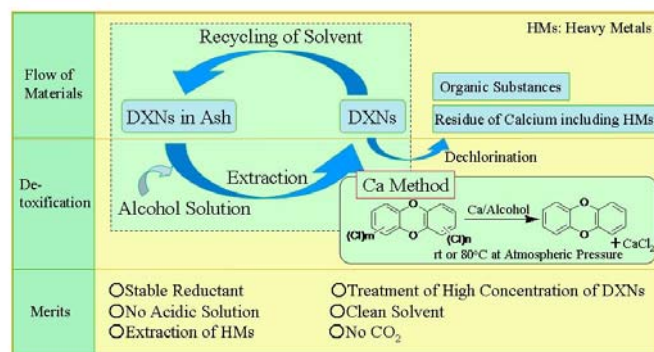
- Development of chemical detoxification method for harmful substances such as Polychlorobiphenyls (PCBs), dioxins (DXNs), and heavy metals.
- Research of novel organic reactions in an aqueous solution

### 1. Dechlorination Using Metallic Calcium.



**Figure 1** Metallic Calcium Method

Detoxification of highly toxic polychlorinated aromatic compounds such as polychlorinated dibenzo-*p*-dioxins (PCDDs), dibenzofurans (PCDFs), and dioxin-like compounds such as coplanar polychlorinated biphenyls (*co*-PCBs) under mild conditions (atmospheric pressure and room temperature) was achieved by a simple stirring operation for 24 h using metallic calcium in ethanol, without any tedious decomposition procedures and harsh conditions such as high temperature and/or high pressure



Extraction (>96%) \* Dechlorination (>99%) = Detoxification > 95%

**Figure 2** Detoxification of DXNs and HMs in Fly Ash

We applied the metallic calcium method for the detoxification of dioxins and heavy metals in fly ash. This study is supported by Industrial Technology Research Grant Program in 04A47002 from New Energy and Industrial Technology Development Organization (NEDO) of Japan.

### 2. Environmental Protection.

- Development of recyclable absorbent for oil in wastewater.

### 3. Novel Organic Reaction in an Aqueous Solution.

- Hydrogenation of alcohols or aromatic hydrocarbons
- Reduction of imines to amines
- Diastereoselective pinacol coupling of aldehydes or ketones.

## Expected Results and Application

- Development of economical and convenient environmental protection techniques.
- Development of novel organic synthetic methods

## Potential Partners

- Environment-related company *etc.*