

## Decomposition of Carbon Tetrachloride ( CCl<sub>4</sub>) with Supercritical Water

Carbon tetrachloride can be decomposed to sodium chloride, water and carbon dioxide in supercritical water containing sodium hydroxide following the reaction path shown in Figure 1. Figure 2 shows the flow diagram of this reaction system. Carbon tetrachloride and sodium hydroxide aqueous solutions are pumped respectively into reaction coil for decomposition, and then the reaction product is collected in a glass tube placed downstream of the back-pressure regulator ( 5 ) as shown in Figure 2. Decomposition efficiency at each reaction temperature was calculated by measuring the amount of sodium chloride (chloride ion) by ion-chromatography (see Figure 3) and the amount of remaining carbon tetrachloride by gas chromatography (see Figure 4), respectively.

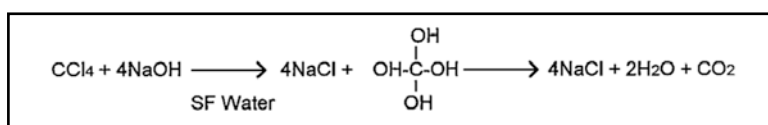


Figure 1 Decomposition of CCl<sub>4</sub> with supercritical water

*Keywords: Supercritical water;  
Carbon tetrachloride;  
Decomposition*

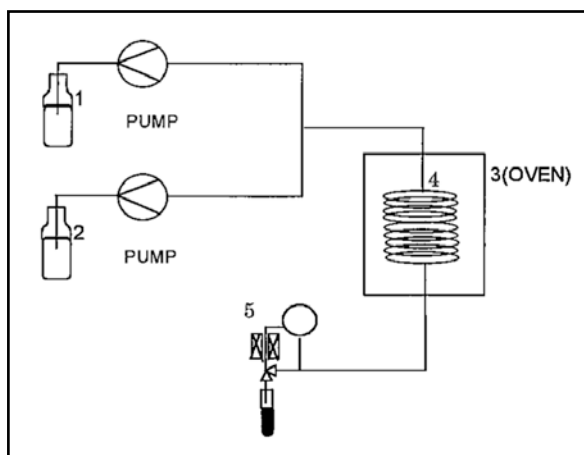


Figure 2 Flow diagram

### Conditions

Reagent 1: 5 M NaOH 2.0 mL/min  
 Sample reagent 2: CCl<sub>4</sub> 0.1 mL/min  
 Reaction temperature: 380, 350, 300, 250, 200, 40°C  
 Reaction coil 4: Hastelloy-C276 tube  
 (0.5 mm I.D. x 5 m Length)  
 = 981 μL  
 Back pressure: 30 MPa

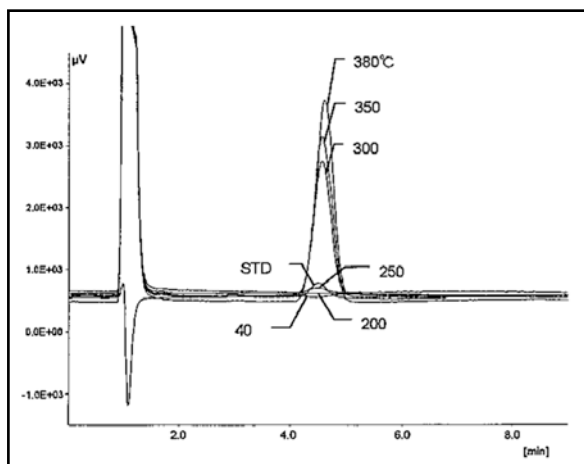


Figure 3 Chromatogram of Cl<sup>-</sup> ion

### Conditions

Detector: Shodex CD-5  
 Column: Shodex IC I-524A  
 Shodex IC I-524AP  
 Eluent: 1.5 mM Phthalic acid adjusted  
 pH 3.0 with Tris.  
 Flow rate: 1.2 mL/min  
 Column temperature: 40 °C  
 Injection volume: 5 μL  
 Sample: STD; NaCl 1.3 ppm  
 UNK; x 500

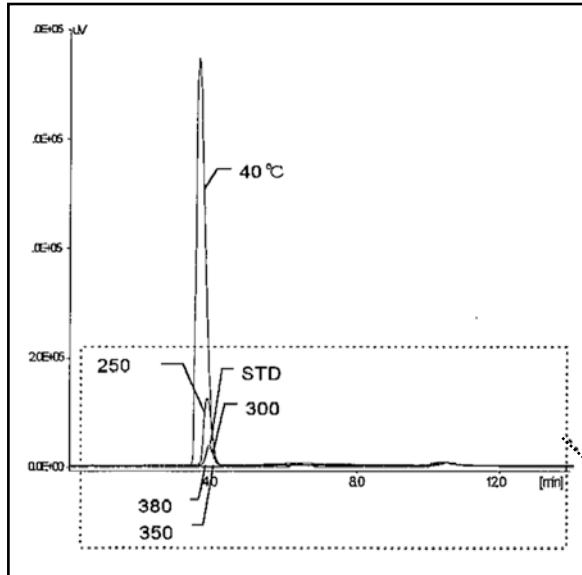


Figure 4 Chromatogram of CCl<sub>4</sub>

**Conditions**

GC: GC-5890 (HP)  
 Detector: FID 10<sup>3</sup>  
 Column: Cemipak NOT  
 Sus Col.6ft x 2 mm I.D.  
 Mobile phase: N<sub>2</sub> at 3 kPa  
 Column temperature: 60 °C  
 Injection volume: 5 μL  
 Sample: 5 mL/mL each of effluent at  
 380, 350, 300 and 40 °C

