Decomposition of Carbon Tetrachloride (CCl₄) 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 Fig. 1. Fig. 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 (S) as shown in Fig. 2. Decomposition efficiency at each reaction temperature was calculated by measuring the amount of sodium chloride (chloride ion) by ion-chromatography (see Fig. 3) and the amount of remaining carbon tetrachloride by gas chromatography (see Fig. 4), respectively.

![Decomposition of CCl₄ with supercritical water](image)

**Fig. 1** Decomposition of CCl₄ with supercritical water

**Conditions**
- Reagent 1: 5 M NaOH  2.0 mL/min
- Sample reagent 2: CCl₄  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

![Flow diagram](image)

**Fig. 2** Flow diagram

![Chromatogram of Cl⁻ ion](image)

**Fig. 3** Chromatogram of Cl⁻ ion

**Keywords:** Supercritical water; Carbon tetrachloride; Decomposition
Conditions

GC: GC-5890 (HP)
Detector: FID 10³
Column: Cemipak NOT
Mobile phase: N2 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

Fig. 4 Chromatogram of CCl₄