

## Non-CO<sub>2</sub> Greenhouse Gases: High-GWP Gases

**Source/Sectors:** Semiconductor Sector

**Technology:** Catalytic decomposition system (C.3.5)

### Description of the Technology:

Catalytic destruction systems are similar to thermal destruction units in that the system is installed in the process after the turbo pump that dilutes the exhaust stream prior to feeding it through the scrubber and emitting the scrubbed gases into the atmosphere. There is no back-flow into the etching tool itself, which could adversely affect the performance of the etching tool. Therefore, it minimizes potential adverse impacts on manufacturing processes (USEPA, 2001; IEA, 2003).

High GWP emissions are oxidized in an electrically heated catalyst before the combustion products are removed by the on-site waste treatment systems, and because of this catalytic process, it operates at lower temperatures.

**Effectiveness:** Good

**Implementability:** The Hitachi system is applicable to CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, C<sub>4</sub>F<sub>8</sub>, and SF<sub>6</sub>.

**Reliability:** The reduction efficiency of this technological option is more than 99% for CF<sub>4</sub>, C<sub>2</sub>F<sub>6</sub>, C<sub>4</sub>F<sub>8</sub>, and SF<sub>6</sub> (US Climate Change, 2005).

**Maturity:** Catalytic Decomposition System (Hitachi) is commercialized and widely being adopted (IEA, 2003).

**Environmental Benefits:** High-GWP gas emission reduction

### Cost Effectiveness:

Technology	Lifetime (yrs)	MP (%)	RE (%)	TA (%)	Capital cost	Annual cost	Benefits
Catalytic decomposition system <sup>1</sup>	5	20	98	40	\$67.35	\$5.32	\$0.00

Note: MP: market penetration; RE: reduction efficiency; TA: technical applicability; costs are in year 2000 US\$/MT<sub>CO<sub>2</sub>-Eq.</sub>  
1: CEC (2005) & USEPA (2001)

**Industry Acceptance Level:** It has adopted by fabrications worldwide (IEA, 2003).

**Limitations:** Catalytic systems require pretreatment of inlet streams to reduce the loads of unused deposition/etchant gases and particles that can block burners or clog catalysts. The design must reflect a minimum concentration and flow of PFC within the exhaust stream; therefore, off-the-shelf systems can be applied only for facilities with certain stream or process specifications (USEPA, 2001). Etch and chamber specific reductions can only reduce emissions from their respective percentage of the total emissions.

### Sources of Information:

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15. U.S. Environmental Protection Agency (2006b) "Global Mitigation of Non-CO<sub>2</sub> Greenhouse Gases", Office of Atmospheric Programs, United States Environmental Protection Agency, EPA-430-R-06-005, June 2006.