RULE 244 SEMICONDUCTOR MANUFACTURING OPERATIONS

Adopted 02-09-95

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100 GENERAL

101 DESCRIPTION: The purpose of this Rule is to limit the emissions of precursor organic compounds from semiconductor manufacturing operations. For the purpose of this Rule, semiconductor manufacturing operations are limited to the manufacture of semiconductor and other related integrated circuits.

102 EXEMPTION, SMALL SEMICONDUCTOR OPERATION: The provisions of Sections 302, and 501 shall not apply to any facility whose total combined negative photoresist maskant and negative photo resist developer consumption is less than 24 gallons per month on a facility wide basis and provided the requirements of Section 402 and Section 502 are met.

103 EXEMPTION, SOLVENT CLEANERS: The provisions of Sections 301 and 302 shall not apply to any vapor degreaser or cold cleaner utilizing solvent flow or with a capacity greater than 10 gallons. Such vapor degreasers or cold cleaners are subject to REGULATION 2, RULE 216, ORGANIC SOLVENT CLEANING AND DEGREASING OPERATIONS.

104 EXEMPTION, COMPOUNDS WITH LOW VOLATILITY: All compounds with an initial boiling point greater than 150 C (302 F) and where the initial boiling point exceeds the actual operating temperature by at least 100 C (180 F) are exempt from the requirements of Section 302.3.

200 DEFINITIONS

201 FREEBOARD HEIGHT: The distance from the top of the solvent or solvent drain to the top of the sink.

202 FREEBOARD RATIO: The freeboard height divided by the smaller of the length or width of the sink or reservoir.

203 MASKING: Application of a maskant material to a wafer to increase or decrease the masked area's resistance to chemical milling.

204 ORGANIC COMPOUND: Any compound of carbon, excluding methane, carbon monoxide, carbon dioxide carbonic acid, metallic carbides or carbonates and ammonium carbonate.

205 EXEMPT ORGANIC COMPOUNDS: For the purposes of this rule, exempt compounds are the following:

205.1 Methane
205.2 Carbon dioxide
205.3 Carbon monoxide
205.4 Carbonic acid
205.5 Metallic carbides or carbonates
205.6 Ammonium carbonate
205.7 1,1,1-trichloroethane
205.8 Methylene chloride
205.9 2,2-dichloro-1,1,1-trifluoroethane (HCFC-123)
205.10 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)
205.11 Trichlorofluoromethane (CFC-11)
205.12 Dichlorodifluoromethane (CFC-12)
205.13 1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113)
205.14 1-chloro-1,1-difluoro-2-chloro-2,2-difluoroethane (CFC-114)

205.15 Chloropentafluoroethane (CFC-115)
205.16 Pentafluoroethane (HFC-125)
205.17 1,1,2,2-tetrafluoroethane (HFC-134)
205.18 Tetrafluoroethane (HFC-134a)
205.19 1,1-dichloro-1-fluoroethane (HCFC-141b)
205.20 1-chloro-1,1-difluoroethane (HCFC-142b)
205.21 1,1,1-trifluoroethane (HFC-143a)
205.22 Chlorodifluoromethane (HCFC-22)
205.23 Trifluoromethane (HFC-23)
205.24 Difluoroethane (HFC-152a)
205.25 The following four classes of perfluorocarbon compounds:

a. Cyclic, branched, or linear, completely fluorinated alkanes.
b. Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations.
c. Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations.
d. Sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

Perfluorocarbon compounds will be assumed to be absent from a product or process unless a manufacturer or facility operator identifies the specific individual compounds (from the broad classes of perfluorocarbon compounds) and the amounts present in the product or process and provides a validated test method which can be used to quantify the specific compounds.

206 PHOTORESIST LINE: Equipment used to apply and develop photoresist masking solution on a wafer. Process includes preparation (except primary cleaning), soft bake, develop and hard bake.

207 PHOTORESIST, NEGATIVE: Maskant hardens when exposed to light. Unhardened maskant is stripped, exposing wafer surface to etching. Typically uses xylene formulated resin and developer solutions.

208 PHOTORESIST, POSITIVE: Maskant softens when exposed to light. Softened maskant is stripped, exposing wafer surface for etching. Typically uses cellosolves for primer and resin carrier with caustic type developer.

209 SEMICONDUCTOR MANUFACTURE: Any operation performed in order to manufacture semiconductor or related solid state devices, such as semiconductor diodes and stacks, and including rectifiers, integrated microcircuits, transistors, solar cells, and light sensing and emitting devices. Semiconductor manufacture includes all processing from crystal growth through circuit separation and encapsulation. Examples of semiconductor operations are: crystal growth, diffusion operations, photoresist operations, wafer processing, etching, etc.

210 SOLVENT CLEANING STATION: Any operation whose primary purpose is to remove surface contaminants or to remove photoresist using a liquid or vapor containing organic compounds.

211 LIQUID SOLVENT LEAKS: A liquid leak of four drops or more per minute from secondary containment.

212 CONTAINERS: For the purposes of Section 301 and Section 302, a container is defined as having a total volume of 1 liter (0.264 gal) or less. Any container with a volume greater than 1 liter is considered a reservoir.

300 STANDARDS

301 NEGATIVE PHOTORESIST OPERATIONS: All exhaust gases containing precursor organic vapors from negative photoresist operations shall be vented to control devices which reduce the total emission of precursor organic compounds to the atmosphere by at least 90 percent by weight.

302 SOLVENT CLEANING STATION LIMITS: A person shall not operate a solvent cleaning station at a semiconductor manufacturing facility unless exhaust organic vapors are vented to control devices that reduce the total emissions of precursor organic compounds to the atmosphere by at least 90% by weight or the following requirements are met:

302.1 All unheated containers, reservoirs and sinks containing precursor organic compounds shall be provided with a cover. These covers must remain closed unless production, sampling, maintenance, loading or unloading procedures require operator access.

302.2 All unheated reservoirs and sinks containing acetone, isopropyl alcohol, methyl alcohol, methyl ethyl ketone, or trichloroethylene shall have a freeboard ratio greater than or equal to 0.75.

302.3 All heated reservoirs, sinks, or containers containing precursor organic compounds shall be provided with a cover as described in Section 302.1. In addition, heated reservoirs and sinks must also have a freeboard ratio greater than or equal to 0.75.

302.4 The capacity of all vapor degreasers and cold cleaners shall be clearly marked by suitable physical or mechanical means.

302.5 Precursor organic compounds including waste solvents, shall not be stored or disposed of in a manner that will allow evaporation into the atmosphere. Storage of organic compounds in tanks which comply with Rule 212, STORAGE OF PETROLEUM PRODUCTS, constitutes compliance with Section 302.5.

302.6 All equipment at a solvent cleaning station shall be operated and maintained in proper working order.

302.7 Liquid solvent leaks shall be repaired immediately or the equipment shall be shut down until repaired.

400 ADMINISTRATIVE REQUIREMENTS

401 RESERVOIRS AND SINKS COMPLIANCE SCHEDULE: Any existing facility subject to Section 302 of this Rule shall comply with the following increments of progress:

401.1 Submit plan for compliance by March 1, 1996.

401.2 Submit to the APCO a complete application for an Authority to Construct for necessary equipment modifications on or before March 1, 1997.

401.3 Complete on-site construction of equipment modifications on or before March 1, 1998.

401.4 Demonstrate final compliance on or before March 1, 1999.

402 SMALL SEMICONDUCTOR OPERATION PETITION: Any person seeking to satisfy the conditions of Section 102 shall comply with the following requirements:

402.1 A written petition for exemption shall be submitted to the APCO, showing the total combined net usage of negative photoresist maskant and negative photoresist developer, is less than 24 gallons per month for the facility. The written petition must be submitted to the APCO by March 1, 1996.

402.2 If the APCO grants written approval, such petition will be repeated every July 1, on an annual basis.

500 MONITORING AND RECORDS

501 ANNUAL REPORTING: Any person subject to Sections 301 or 302 of this Rule shall report the following on an annual basis, prior to renewal of Permits to Operate:

501.1 Quantity of each of the following liquid organic compounds purchased during the previous 12 months for use in semiconductor manufacturing.

Xylene
n-Butyl Acetate
Acetone
Isopropyl Alcohol
Methyl Ethyl Ketone
Trichloroethylene
All other precursor organic compounds (total)
Methylene Chloride
1,1,1 Trichloroethane
All other non-precursor organic compounds (total)

501.2 Separate totals of precursor and non-precursor organic compounds disposed of or reclaimed in liquid form from semiconductor manufacturing operations during the previous 12 months.

502 RECORDS: Any person seeking to satisfy the conditions of Section 102 shall comply with the following requirements:

502.1 A weekly record shall be kept showing the facility wide combined net usage of negative photoresist maskant and negative photoresist developer.

502.2 Such records shall be maintained and be available for inspection by the APCO for the previous 24 month period.

503 NEGATIVE PHOTORESIST SOURCE TESTS: Any person subject to Section 301 shall conduct a source test of the abatement device to demonstrate compliance. Results of the tests shall be submitted within 90 days of (Date of adoption by the Board of Directors), or 90 days after start up of affected equipment, whichever is later. The APCO shall be contacted in writing no less than 15 days prior to testing. Equipment that has previously undergone a District

approved source test and successfully demonstrated compliance under Rule 244 requirements need not be retested.

504 TEST METHODS

504.1 Determination Of Abatement Efficiency: Abatement Efficiency of precursor organic compounds as specified in Section 302 shall be measured as prescribed by EPA Method 25 or 25A. A source shall be considered in violation if the VOC emissions measured by any of the test methods exceed the standards of this rule.

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