

Table S5. The proposed Chemicals for Additional AOP-based Hazard Evaluations in semiconductor manufacturing.

No.	Chemicals	CAS No.	In Process	MIEs	KEs	AOs	GHS category	OSH Act	Chemicals control Act	ACT ON THE SAFETY CONTROL OF HAZARDOUS SUBSTANCES	WASTES CONTROL ACT
1	1-Methoxy-2-propanol	107-98-2	Wafer processing, Photo (PR solvent)	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 3	For Process safety management (PSM) Chemicals for exposure limits	N/A	Class 4 the second petroleum (Water-soluble) (2,000 L)	Designated waste
2	1-nitronaphthalene	86-57-7	Intermediate for manufacturing branched light emitting agents for OLED devices	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable solid Cat. 2 Acute toxic (Oral) Cat. 3 Chronic aquatic toxicity Cat. 2	N/A	Toxic	N/A	N/A
3	2,2',6,6'-Tetrabromobisphenol A	79-94-7	Semiconductor and other electronic component manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Reproductive toxicity Cat. 1B Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	N/A	Toxic	N/A	N/A
4	2-Butoxyethanol	111-76-2	Overall Chip assembly	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 4 Acute toxic (Inhalation: Vapor) Cat. 3 Skin corrosion/irritation Cat. 2 Serious eye damage/eye irritation Cat. 2 Carcinogenicity Cat. 2	Chemicals for working environment measurement (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits Chemicals for working environment measurement. (Each 6 months)	N/A	Class 4 the second petroleum (Water-soluble) (2,000 L)	Designated waste
5	2-Methoxyethanol	109-86-4	Manufacture wafers for semiconductor manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 3 Acute toxic (Oral) Cat. 4 Acute toxic (dermal) Cat. 4 Acute toxic (inhalation: gas) Cat. 4 Reproductive toxicity Cat. 1B Specific target organ toxicity (Repeated exposure Cat. 2)	Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for special management For Process safety management (PSM) Chemicals for exposure limits	Toxic	Class 4 the second petroleum (Water-soluble) (2,000 L)	Designated waste
6	4-Chloro-2-methylphenol	1570-64-5	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (inhalation: dust/mist) Cat. 3 Skin corrosion/irritation Cat. 1 Germ cell mutagenicity Cat. 1B Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	N/A	N/A	N/A	Designated waste
7	9-Bromoanthracene	1564-64-3	Intermediate for manufacturing OLED emitters	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	No data	N/A	N/A	N/A	N/A
8	Acetaldehyde	75-07-0	Mold, Chip assembly	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 1 Acute toxic (Oral) Cat. 4 Serious eye damage/eye irritation Cat. 2 Germ cell mutagenicity Cat. 2 Carcinogenicity Cat. 1B Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation)	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) For Process safety management (PSM) Chemicals for exposure limits Chemicals for working environment measurement. (Each 6 months)	N/A	Class 4 Special flammable (50 L)	Designated waste
9	Acetonitrile	75-05-8	Semiconductor Electrodes	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 2 Acute toxic (Oral) Cat. 4 Serious eye damage/eye irritation Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation)	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health	N/A	Class 4 the first petroleum (Water-soluble) (400 L)	N/A

10	Antimony trichloride	10025-91-9	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Corrosive to metal Cat. 1 Acute toxic (Oral) Cat. 4 Serious eye damage/eye irritation Cat. 2 Chronic aquatic toxicity Cat. 2	exam. (Each 12 months) For Process safety management (PSM) Chemicals for exposure limits Chemicals for working environment measurement Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits Chemicals for permission Chemicals for working environment measurement. Chemicals for working environment measurement. (Each 6 months) Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	Toxic	N/A	Designated waste
11	Arsenic trioxide	1327-53-3	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 2 Serious eye damage/eye irritation Cat. 1 Carcinogenicity Cat. 1A Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	measurement. (Each 6 months) Chemicals for special health exam. Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits Chemicals for permission Chemicals for working environment measurement. Chemicals for working environment measurement. (Each 6 months) Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	Toxic	N/A	Designated waste
12	Bisphenol A	80-05-7	Packaging	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Serious eye damage/eye irritation Cat. 1 Skin sensitization Cat. 1 Reproductive toxicity Cat. 1B Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Chronic aquatic toxicity Cat. 1 Acute toxic (Oral) Cat. 3 Acute toxic (dermal) Cat. 3 Skin corrosion/irritation Cat. 2	N/A	Toxic	N/A	N/A
13	Catechol	120-80-9	Wafer processing, Photo (PR removal)	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Serious eye damage/eye irritation Cat. 1 Germ cell mutagenicity Cat. 2 Carcinogenicity Cat. 2 Flammable liquid Cat. 3 Carcinogenicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Aspiration hazard Cat. 1 Chronic aquatic toxicity Cat. 2 Acute toxic (Oral) Cat. 4 Skin corrosion /irritation Cat. 2	Chemicals for exposure limits	N/A	N/A	Designated waste
14	Cumene	98-82-8	Substitute for benzene in direct photocatalytic hydroxylation (of benzene)	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Aspiration hazard Cat. 1 Chronic aquatic toxicity Cat. 2 Acute toxic (Oral) Cat. 4 Skin corrosion /irritation Cat. 2 Serious eye damage/eye irritation Cat. 2 Carcinogenicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Aspiration hazard Cat. 1 Chronic aquatic toxicity Cat. 2 Acute toxic (Oral) Cat. 4 Skin corrosion /irritation Cat. 2	For Process safety management (PSM) Chemicals for exposure limits	N/A	Class 4 the second petroleum (Insoluble) (1,000 L)	Designated waste
15	Diethanolamine	111-42-2	Used to remove unnecessary photoresist layers after turning and developing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Specific target organ toxicity (Repeated exposure) Cat. 2 Chronic aquatic toxicity Cat. 3	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for exposure limits	N/A	Class 4 the third petroleum (Water-soluble) (4,000 L)	Designated waste
16	Diethylene glycol monobutyl ether	112-34-5	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Serious eye damage/eye irritation Cat. 2	Chemicals for exposure limits	N/A	Class 4 the third petroleum (Water-soluble) (4,000 L)	N/A
17	Dimethyl acetamide	127-19-5	Photo(diluent)	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (dermal) Cat. 4 Acute toxic (inhalation: Vapor) Cat. 3 Serious eye damage/eye irritation Cat. 2 Carcinogenicity Cat. 2	Chemicals for working environment measurement. (Each 6 months) Chemicals for	Toxic	Class 4 the second petroleum (Water-soluble) (2,000 L)	N/A

18	Ethyl acetate	141-78-6	Chip assembly, Chip adhesion, mold, Solder ball attachment, etc.	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Reproductive toxicity Cat. 1B Flammable liquid Cat. 2 Serious eye damage/eye irritation Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Narcotic effect) Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation)	management Chemicals for special health exam. (Each 6 months) Chemicals for special management Chemicals for exposure limits Chemicals for working environment measurement. (Each 6 months) Chemicals for management For Process safety management (PSM) Chemicals for exposure limits Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	Toxic Chemicals for accident prep.	Class 4 the first petroleum (Insoluble) (200 L)	Designated waste	
19	Ethylene glycol	107-21-1	CVD, Dry etching, Wafer processing, Ion implantation	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 2 Serious eye damage/eye irritation Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Specific target organ toxicity (Single exposure) Cat. 2 Specific target organ toxicity (Repeated exposure) Cat. 2	Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	N/A	Class 4 the third petroleum (Water-soluble (4,000 L)	Designated waste	
20	Glycerol	56-81-5	Chip assembly, Solder ball attachment	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	No data	Chemicals for exposure limits	N/A	Class 4 the third petroleum (Water-soluble (4000 t)	N/A	
21	Hexamethyldisilazane	999-97-3	HMDS was used to silanize the surface of silicon wafer	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 2 Acute toxic (Oral) Cat. 4 Acute toxic (dermal) Cat. 3 Acute toxic (inhalation: Vapor) Cat. 3 Skin corrosion/irritation Cat. 1 Serious eye damage/eye irritation Cat. 1 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Chronic aquatic toxicity: Cat. 4 Acute toxic (Oral): Cat. 4 Serious eye damage/eye irritation: Cat. 1 Skin sensitization: Cat. 1 Germ cell mutagenicity: Cat. 2	For Process safety management (PSM)	N/A	Class 4 the first petroleum (Insoluble liquid) (200 L)	N/A	
22	Hydroquinone	123-31-9	A Semiconductor and Fluorescence Dual-Mode Room-Temperature Ammonia Sensor Achieved by Decorating Hydroquinone into a Metal-Organic Framework	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Carcinogenicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Specific target organ toxicity (Repeated exposure) Cat. 2 Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	Toxic	N/A	Designated waste	
23	Indium arsenide	1303-11-3	A semiconductor composed of indium and arsenic	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	-	-	-	-	-	-
24	Indium phosphide	2398-80-7	Manufacture of semiconductor wafers	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Carcinogenicity Cat. 1B Reproductive toxicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 2 Specific target organ toxicity (Repeated exposure) Cat. 1	Chemicals for management (Indium and its compounds) Chemicals for working environment measurement. (Each 6 months) Chemicals for management (Indium and its compounds (From 2021.1.1.)) Chemicals for special health exam. (Each 12 months) (Indium and its compounds) (from 2021.1.1.) Chemicals for exposure limits	N/A	N/A	N/A	

25	Methyl-3-methoxy propionate	3852-09-3	Wafer processing, Photo (PR solvent)	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	No data	N/A	N/A	N/A	Designated waste
26	Naphthalene	91-20-3	Simple organic semiconductor	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable solid Cat. 2 Acute toxic (Oral) Cat. 4 Carcinogenicity Cat. 2 Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	Chemicals for exposure limits	N/A	N/A	N/A
27	n-Butyl alcohol	71-36-3	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 3 Skin corrosion/irritation Cat. 2 Serious eye damage/eye irritation Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Narcotic effect) Aspiration hazard Cat. 2	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) For Process safety management (PSM) Chemicals for exposure limits	N/A	Class 4 the second petroleum (Insoluble) (1,000 L)	Designated waste
28	Nitrioltriacetic acid	139-13-9	Chemical Bath Deposition Of Group Ii-vi Semiconductor Thin Films For Solar Cels Applications	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 4 Serious eye damage/eye irritation Cat. 2 Carcinogenicity Cat. 1B Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Specific target organ toxicity (Repeated exposure) Cat. 2 Chronic aquatic toxicity Cat. 3	N/A	N/A	N/A	N/A
29	Nitrobenzene	98-95-3	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 4 Acute toxic (dermal) Cat. 3 Acute toxic (inhalation: Vapor) Cat. 3 Carcinogenicity Cat. 2 Reproductive toxicity Cat. 2 Specific target organ toxicity (Repeated exposure) Cat. 1 Chronic aquatic toxicity Cat. 3	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for exposure limits	Toxic Chemicals for accident prep.	Class 4 the third petroleum (Insoluble) (2,000 L)	Designated waste
30	Pentaerythritol triacrylate	3524-68-3	Organic semiconductor, CSA-doped PANI as a gate electrode, and cross-linked pentaerythritol triacrylate (PETA) as a gate insulator	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 4 Skin corrosion/irritation Cat. 2 Serious eye damage/eye irritation Cat. 2 Skin sensitization Cat. 1	N/A	N/A	Class 4 the fourth petroleum (6,000 L)	N/A
31	Perfluorooctane sulfonic acid	1763-23-1	Photomicroolithography	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 2 Acute toxic (Oral) Cat. 4 Acute toxic (inhalation: gas) Cat. 4 Acute toxic (inhalation: dust/mist) Cat. 4 Serious eye damage/eye irritation Cat. 2 Carcinogenicity Cat. 2 Reproductive toxicity Cat. 1B Specific target organ toxicity (Repeated exposure) Cat. 1 Chronic aquatic toxicity Cat. 2	N/A	N/A	N/A	N/A
32	Phenol	108-95-2	Chip assembly, Mold etc.	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 3 Acute toxic (dermal) Cat. 3 Acute toxic (inhalation: dust/mist) Cat. 3 Skin corrosion/irritation Cat. 1 Serious eye damage/eye irritation Cat. 1 Germ cell mutagenicity Cat. 2 Specific target organ toxicity (Repeated exposure) Cat. 2 Chronic aquatic toxicity Cat. 2	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for special management Chemicals for exposure limits	Toxic Chemicals for accident prep.	N/A	Designated waste

33	Piperazine	110-85-0	Chip assembly, Rear Grinding	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 4 Acute toxic (dermal) Cat. 4 Skin corrosion/irritation Cat. 1 Serious eye damage/eye irritation Cat. 1 Respiratory sensitization Cat. 1 Skin sensitization Cat. 1 Reproductive toxicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 2 Specific target organ toxicity (Repeated exposure) Cat. 1	N/A	N/A	N/A	N/A
34	Potassium dichromate	7778-50-9	Photocatalytic reduction using UV radiation and ZnO semiconductor catalyst has been investigated using potassium dichromate as the model Compound	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Oxidizing solids Cat. 2 Acute toxic (Oral) Cat. 3 Acute toxic (dermal) Cat. 4 Acute toxic (inhalation: gas) Cat. 2 Acute toxic (inhalation: dust/mist) Cat. 2 Serious eye damage/eye irritation Cat. 2 Respiratory sensitization Cat. 1 Skin sensitization Cat. 1 Germ cell mutagenicity Cat. 1B Carcinogenicity Cat. 1A Reproductive toxicity Cat. 1B Specific target organ toxicity (Repeated exposure) Cat. 1 Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	Chemicals for working environment measurement Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. Chemicals for special health exam. (Each 12 months) Chemicals for special management Chemicals for exposure limits Chemicals for acceptance criteria Chemicals for working environment measurement.	Toxic Restricted chemical	Class 1: Dichromic acids (1000 kg)	Designated waste
35	Tetrachloroethylene	127-18-4	Mold, Chip adhesion, Chip assembly, Testing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Skin corrosion/irritation Cat. 2 Carcinogenicity Cat. 1B Specific target organ toxicity (Single exposure) Cat. 3 (Narcotic effect) Chronic aquatic toxicity Cat. 2	Chemicals for management Chemicals for special health exam. (Each 12 months) Chemicals for special management Chemicals for exposure limits	Toxic Restricted chemical	N/A	Designated waste
36	Tetramethyl ammonium hydroxide	75-59-2 10424-6-5 (Trihydrate) 10424-65-4 (Pentahydrate)	Wafer processing, Chip assembly, Photo (developer), Rear grinding	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Acute toxic (Oral) Cat. 2 Acute toxic (dermal) Cat. 1 Skin corrosion/irritation Cat. 1 Serious eye damage/eye irritation Cat. 1 Chronic aquatic toxicity Cat. 2	Chemicals for exposure limits	Toxic	N/A	Designated waste
37	Toluene	108-88-3	Chip assembly, Mold, etc.	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Flammable liquid Cat. 2 Skin corrosion/irritation Cat. 2 Reproductive toxicity Cat. 2 Specific target organ toxicity (Single exposure) Cat. 3 (Narcotic effect) Specific target organ toxicity (Repeated exposure) Cat. 2 Aspiration hazard Cat. 1	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) For Process safety management (PSM) Chemicals for exposure limits Chemicals for acceptance criteria	Toxic Chemicals for accident prep.	Class 4 the first petroleum (Insoluble) (200 L)	Designated waste
38	Trimellitic anhydride	552-30-7	Semiconductor assemblies having electrophoretically insulated vias	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Serious eye damage/eye irritation Cat. 1 Respiratory sensitization Cat. 1 Skin sensitization Cat. 1 Specific target organ toxicity (Single exposure) Cat. 3 (Respiratory irritation) Acute toxic (Oral) Cat. 4	Chemicals for exposure limits	N/A	N/A	Designated waste
39	Zinc chloride fume	7646-85-7	Semiconductor Manufacturing	1181 Activation, Estrogen receptor	1182 Increase, Cell Proliferation (Epithelial Cells)	1193 N/A, Breast Cancer	Serious eye damage/eye irritation Cat. 1 Germ cell mutagenicity Cat. 2 Acute aquatic toxicity Cat. 1 Chronic aquatic toxicity Cat. 1	Chemicals for management Chemicals for exposure limits	Toxic	N/A	Designated waste

40	Nitric oxide (Nitrogen monoxide)	10102-43-9	Wafer processing, Diffusion	1632 Increase in reactive oxygen and nitrogen species (RONS)	1182 Increase, Cell Proliferation (Epithelial Cells) 1492 Tissue resident cell activation 1493 Increased Pro- inflammatory mediators 1494 Leukocyte recruitment/activation	1193 N/A, Breast Cancer	Oxidizing gas Cat. 1 Compressed gas Acute toxic (inhalation: gas) Cat. 2 Specific target organ toxicity (Single exposure) Cat. 1	Chemicals for working environment measurement. (Each 6 months) Chemicals for management Chemicals for special health exam. (Each 12 months) For Process safety management (PSM) Chemicals for exposure limits	Chemicals for accident prep.	N/A	N/A
41	Nitrogen trifluoride	7783-54-2	A high purity special gas used as a cleaning agent for semiconductor and LCD manufacturing equipment, and as a dry etching agent	1632 Increase in reactive oxygen and nitrogen species (RONS)	1182 Increase, Cell Proliferation (Epithelial Cells) 1492 Tissue resident cell activation 1493 Increased Pro- inflammatory mediators 1494 Leukocyte recruitment/activation	1193 N/A, Breast Cancer	Oxidizing gas Cat. 1 Compressed gas Acute toxic (inhalation: gas) Cat. 4 Specific target organ toxicity (Repeated exposure) Cat. 2	For Process safety management (PSM) Chemicals for exposure limits	N/A	N/A	N/A
