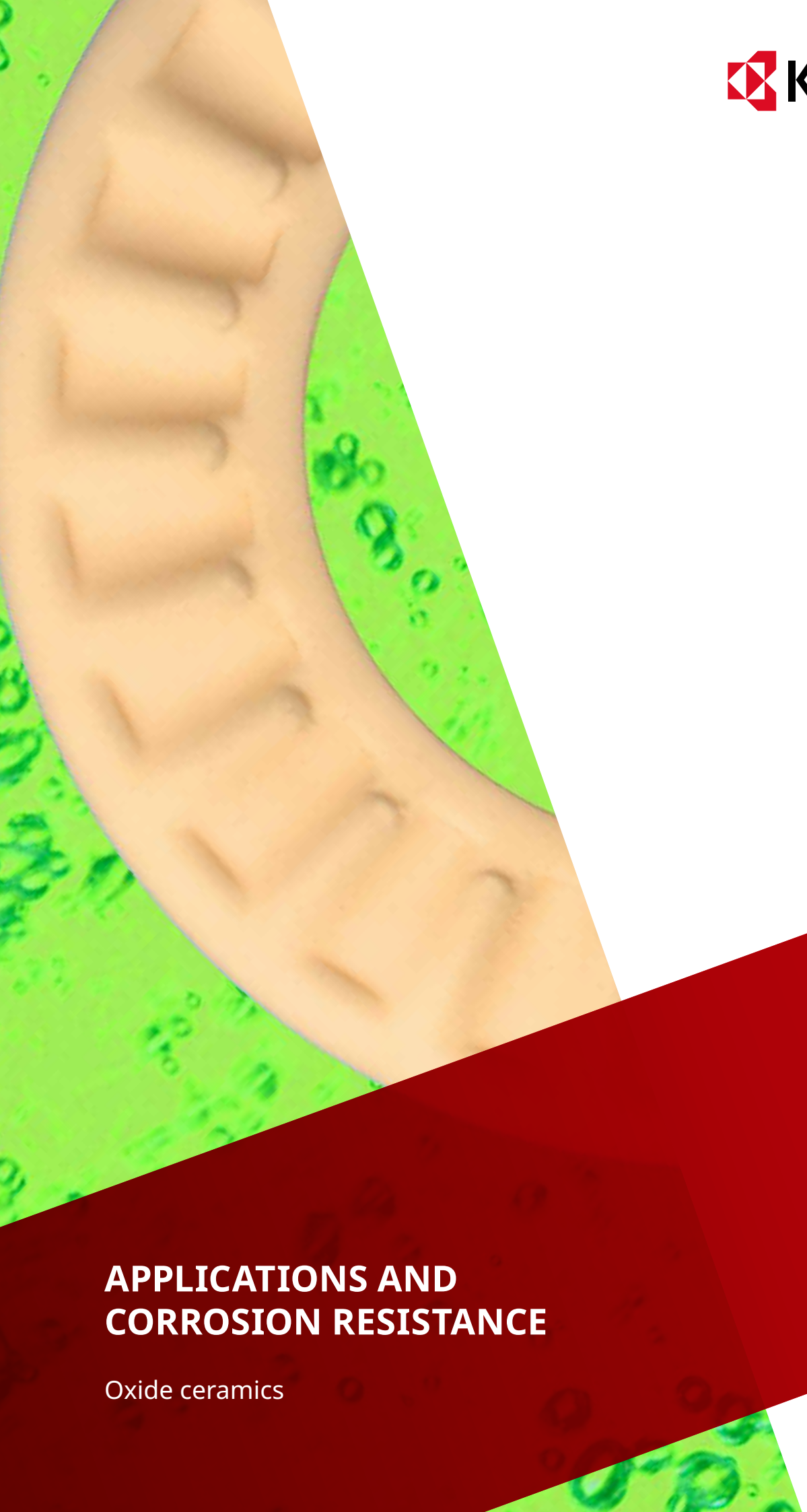

APPLICATIONS AND CORROSION RESISTANCE

Oxide ceramics

OXIDE CERAMIC MATERIALS AND APPLICATIONS

Material	Kyocera trade name	Description	Typical applications
Al_2O_3 Aluminium oxide	**F99.7**	Pure Al_2O_3, dense, extremely resistant to wear and corrosion, very high electrical insulating properties	Matched piston/cylinder units, bearings, shafts and valve components, electrical feedthroughs, brazed ceramic to metal seals for x-ray-technology and ionic accelerators for medical technology, dielectrics for fuel cells, sensor caps
	DEGUSSIT DD57	Pure Al_2O_3, dense, red colour, wear resistant and tough, also called „sintered ruby“	Fine grinding tools for finishing hard materials for precision engineering, knife sharpener
	DEGUSSIT AL23	Pure Al_2O_3, dense, excellent thermal and electrical resistance properties, corrosion resistant, permeable for microwaves	Protection tubes for thermocouples, furnace construction parts, laboratory ware e.g. crucibles, boats and plates, reactor lining in the chemical industry, microwave-technology
	DEGUSSIT AL24	Pure Al_2O_3, slightly porous, good resistance to thermal shock, extremely good creep strength	Tubes, laboratory ware, furnace construction parts
	DEGUSSIT AL25	Pure Al_2O_3, very porous, good thermal insulation, highest resistance to thermal shock of all the Al_2O_3 materials	Tubes, laboratory ware, furnace construction parts
Al_2O_3 (+ZrO_2) Aluminium oxide, fine grain stabilized	**FZT**	Al_2O_3 toughened with ZrO_2, dense, high strength, good resistance to thermal shock, extremely resistant to wear and corrosion, fine grain size	Vacuum plates for paper-making, flow meter tubes for chemical industry, positioning pins for automotive industry

Material	KYOCERA trade name	Description	Typical applications
ZrO_2 Zirconium Oxide	**FZM**	ZrO_2 partially stabilized with MgO, dense, high strength and highly wear resistant, extremely resistant to corrosion and thermal shock	High pressure pistons, pressing dies, components for mills, ceramic isolation shells for magnetic drive centrifugal pumps, metal forming tools
	DEGUSSIT FZY	Partially stabilized with Y_2O_3, dense, high purity ZrO_2, high temperature and corrosion resistance, ion conducting for measuring oxygen	Crucibles, heat-treatment bowls, oxygen measurement
	FZM/K	Tetragonally stabilized with Y_2O_3, dense, very fine grain size, highest breaking strength and wear resistance	Cutting elements, wear protection plates
	ZR 25	ZR 25 is a porous material consisting of magnesium-stabilised zirconium oxide. It is characterised by its high thermal shock resistance and good chemical resistance.	Crucibles, kiln furniture, annealing dishes

CORROSION RESISTANCE

The following tables show the corrosion properties of oxide ceramics and other special materials. These data are based on chemical conditions as far as we know them.

To a large extent the corrosion resistance data of the different materials result from laboratory tests. Generally, however, corrosive conditions in practical operation are essentially more differentiated.

The smallest portions of an intermediate product appearing only for a short time may finally determine corrosive attacks. In cases where a particular application cannot be based on reliable experiences, the corrosion resistance of our materials is to be determined by test specimens under process conditions.

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ABBREVIATIONS:

A	resistant
B	weak reaction
C	strong reaction
rt	room temperature
b	boiling
conc.	concentrated
sat.	saturated
Empty cells	no data available

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
Acetaldehyde	CH_3CHO		rt	A	A	A	A	A	C	C	C	B	B	C
Acetic acid	CH_3COOH	5	rt	A	A	A	A	A	C	C	A	B	B	B
		5	b	A	A	A	A	A	C	C	A	B	B	B
		10	rt	A	A	A	A	A	C	C	A	B	B	B
		10	b	A	A	A	A	A	C	C	A	B	B	B
		50	rt	A	A	A	A	A	C	C	A	B	B	B
		50	b	A	A	A	A	A	C		A	B	B	B
		80	rt	A	A	A	A	A	C	C	A	B	B	B
		80	b	A	A	A	A	A	C	C	A	B	B	B
		conc.	rt	A	A	A	A	A	C	C	A	B	B	B
		conc.	b	A	A	A	A	A	C	C	A	B	B	B
Acetic acid anhydride	$(CH_3CO)_2O$		rt	A	A	A	A	A	C	C	A	B	B	B
Acetone	CH_3CHOCH_3	100	rt	A	A	A	A	A	C	C	B	B	A	C
Alum	$K_2Al_2(SO_4)_4$	10	rt	A	A	A	A	A	A	B	A	A	A	A
Aluminium chloride	$AlCl_3$	10	rt	A	A	A	A	A	A	B	A	B	A	A
		10	100	A	A	A	A	A	A	B	A	B	A	A
		25	60	A	A	A	A	A	A	B	A	B	A	A
		25	100	A	A	A	A	A	A	B	A	B	A	A
		80	b	A	A	A	A	A	A	B	A	B	A	A
Aluminium sulfate	$Al_2(SO_4)_3$	10	rt	A	A	A	A	A	A	B	A	A	A	A
		10	b	A	A	A	A	A	A	B	A	A	A	A
		15	50	A	A	A	A	A	A	B	A	A	A	A
		20	55	A	A	A	A	A	A	B	A	A	A	A
		25	b	A	A	A	A	A	A	B	A	A	A	A
		50	b	A	A	A	A	A	A	B	A	A	A	A
		55	40	A	A	A	A	A	A	B	A	A	A	A
		57	120	A	A	A	A	A	A	B	A	A	A	A
Ammonia, Ammonium hydroxide	NH_3 NH_4OH	10	rt	A	A	A	A	A	B	B	A	A	A	A
		10	b	A	A	A	A	A	B	B	A	A	A	A
		20	b	A	A	A	A	A	B	B	A	A	A	A
		25	b	A	A	A	A	A	B	B	A	A	A	A
		conc.	rt	A	A	A	A	A	B	B	A	A	A	A
		conc.	100	A	A	A	A	A	B	B	A	A	A	A
Ammonium bromide	NH_4Br	10	25	A	A	A	A	A	A	A	A	A	A	A
Ammonium carbonate	$(NH_4)_2CO_3$	10-20	b	A	A	A	A	A	A	B	A	A	A	A
		30	80	A	A	A	A	A	A	B	A	A	A	A
		30	b	A	A	A	A	A	A	B	A	A	A	A
		40	b	A	A	A	A	A	A	B	A	A	A	A
		50	b	A	A	A	A	A	A	B	A	A	A	A
		sat.	rt	A	A	A	A	A	A	B	A	A	A	A
		sat.	b	A	A	A	A	A	A	B	A	A	A	A
Ammoniumchloride	NH_4Cl	10	rt	A	A	A	A	A	A	A	A	A	A	A
		10	b	A	A	A	A	A	A	A	A	A	A	A
		25	rt	A	A	A	A	A	A	A	A	A	A	A

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		25	b	A	A	A	A	A	A	A	A	A	A	A
		50	rt	A	A	A	A	A	A	A	A	A	A	A
Ammonium chloride	NH_4Cl	50	b	A	A	A	A	A	A	A	A	A	A	A
		sat.	rt	A	A	A	A	A	A	B	A	A	A	A
		sat.	b	A	A	A	A	A	A	B	A	A	A	A
Ammonium fluoride	NH_4F	20	80				A				A	A		
Ammonium hydroxide	NH_4OH	28	20-60	A	A	A	A	A	B	B	A	A	A	A
Ammonium nitrate	NH_4NO_3	10	rt	A	A	A		A	A	B	A	A	A	A
		20	rt	A	A	A		A	A	B	A	A	A	A
		20	rt	A	A	A		A	A	B	A	A	A	A
		50	rt	A	A	A		A	A	B	A	A	A	A
		50	b	A	A	A		A	A	B	A	A	A	A
Ammonium sulfate	$(NH_4)_2SO_4$	all	rt	A	A	A	A	A	A	B	A	A	A	A
		all	b	A	A	A	A	A	A	B	A	A	A	A
Aniline	$C_6H_5NH_2$		rt	A	A	A	A	A	A	C	C	B	A	C
			b	A	A	A	A	A	A	C	C	B	A	C
Aqua regia	HCI:HNO_3	3:1	rt	A	A	A	A	A	B	C	C	C	C	B
Arsenic acid	H_3AsO_3		rt	A	A	A	A	A	A	B	A	A	A	A
Barium chloride	$Ba(OH)_2$	20	rt	A	A	A	A	A	A	A	A	A	A	A
		20	100	A	A	A	A	A	A	A	A	A	A	A
Barium hydroxide	$Ba(OH)_2$	sat.	rt	A	A	A	A	A		A	A	A		
		sat.	b	A	A	A	A	A						
Benzenesulfonic acid	$C_6H_5SO_3H$		70	A	A	A	A	A				A		
Benzoic acid	C_6H_5COOH	all	rt	A	A	A	A	A				A		
Benzol, Benzene	C_6H_6		rt	A	A	A	A	A	A	C	C	C	C	C
Boric acid	H_3BO_3	10	b	A	A	A	A	A	A	B	A	A	A	A
		50	b	A	A	A	A	A	A	B	A	A	A	A
Bromide	Br	dry	rt	A	A	A	C	A	B	C	C	C	C	B
			b	A	A	A	C	A	B	C	C	C	C	B
Butyl acetate	$C_6H1_2O_2$		rt	A	A	A	A	A	C	C	C	C	B	C
Butyl alcohol	C_4H_9OH		rt	A	A	A	A	A	A	B	A	A	A	B
			b	A	A	A	A	A	A	B	A	A	A	B
Butyric acid	C_3H_7COOH	100	rt	A	A	A	A	A			A	A		
		100	b	A	A	A	A	A			A	A		
Calcium bisulfite	$Ca(HSO_3)$		rt	A	A	A	A	A	A	C	B	B	A	A
Calcium hypochlorite	$CaCI_2O_2$	20	40	A	A	A	A	A	A	C	B	C	C	A
Calcium nitrate	$Ca(NO_3)_2$		rt	A	A	A	A	A	A	B	A	A	A	A
Calcium sulfate	$CaSO_4$	1-5	rt	A	A	A	A	A	A	B	A	A	A	A
		10	b	A	A	A	A	A	A	B	A	A	A	A
Carbon disulfide	CS_2		rt	A	A	A	A	A	A	C	C	C	C	C
			b	A	A	A	A	A	A	C	C	C	C	C
Carbon tetrachloride	CCl_4		rt	A	A	A	A	A	B	C	C	C	C	C
Carnallite	$MgCl_2KCI_6H_2O$		90	A	A	A	A	A	A	B	A	A	A	A
Chloral	CCl_3CHO		50	A	A	A	A	A						
Chloride	Cl_2	dry	rt	A	A	A	A	A	A	C	C	C	B	B

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
			70	A	A	A	C	A	A	C	C	C	B	B
Chloride	CH_3+H_2O>0,6%	moist	rt	A	A	A	A	A	A	C	C	C	C	B
			100	A	A	A	C	A	A	C	C	C	C	B
Chloroacetic acid	$CH_2ClCOOH$	50	20	A	A	A	A	A	C	C	C	C	B	B
		70	b	A	A	A	A	A	C	C	C	C	B	B
Chloroacetic acid	$CH_2ClCOOH$	100	rt	A	A	A	A	A	C	C	C	C	B	B
		100	b	A	A	A	A	A	C	C	C	C	B	B
Chlorobenzene	C_6H_5Cl		20	A	A	A	A	A	B	C	C	C	C	C
Chlorosulfonic acid	$SO_2(OH)Cl$		rt	A	A	A	A	A	C	C	C	C	C	C
			b	A	A	A	C	A	C	C	C	C	C	C
Chromium acid	H_2CrO_4	10	rt	A	A	A	A	A	A	C	C	C	C	B
		10	b	A	A	A	C	A	A	C	C	C	C	B
		50	rt	A	A	A	C	A	A	C	C	C	C	B
		50	b	A	A	A	C	A	A	C	C	C	C	B
Citric acid	$C_6H_8O_7$	5	rt	A	A	A	A	A	A	B	A	A	A	A
		5	b	A	A	A	A	A	A	B	A	A	A	A
		25	rt	A	A	A	A	A	A	B	A	A	A	A
		25	b	A	A	A	A	A	A	B	A	A	A	A
		50	rt	A	A	A	A	A	A	B	A	A	A	A
		50	b	A	A	A	A	A	A	B	A	A	A	A
Copper sulfate	$CuSO_4$	5	rt	A	A	A	A	A	A	A	A	A	A	A
		5	b	A	A	A	A	A	A	A	A	A	A	A
		25	b	A	A	A	A	A	A	A	A	A	A	A
		50	b	A	A	A	A	A	A	A	A	A	A	A
		all	b	A	A	A	A	A	A	A	A	A	A	A
Copper-(II)-chloride	$CuCl_2 \cdot {}_2H_2O$	20	rt	A	A	A	A	A	A	A	A	A	A	A
		20	b	A	A	A	A	A	A	A	A	A	A	A
		40	b	A	A	A	A	A	A	A	A	A	A	A
		50	rt	A	A	A	A	A	A	A	A	A	A	A
		sat.	b	A	A	A	A	A	A	A	A	A	A	A
Dichloro ethane	$C_2H_4Cl_2$	100	50	A	A	A	A	A		C		C		
Dichloro ethylene	C_2H_2Cl		b	A	A	A	A	A				C		
Dioxane	$O_2(CH_2)_4$			A	A	A	A	A		C	C	C	C	
Diphenyl	$C_6H_5C_6H_5$			A	A	A	A	A	C	C	C	C	C	
Ether	$(C_2H_5)_2O$		rt	A	A	A	A	A	C	C	C	C	C	C
Ethylacetate	$CH_3COOC_2H_5$		rt	A	A	A	A	A	C	C	C	C	B	C
Ethylalcohol, Ethanol	C_2H_5OH		rt	A	A	A	A	A	A	B	A	A	A	A
Ethylchloride	C_2H_5Cl		rt	A	A	A	A	A	B	C	C	C	C	C
Ferric nitrate	$Fe(NO_3)_3$	all	rt	A	A	A	A	A	A	B	A	B	A	A
Ferric-(II)-Chloride	$FeCl_2$	30	100	A	A	A	A	A	A	B	A	B	A	A
		10	b	A	A	A	A	A	A	B	A	B	A	A
		30	rt	A	A	A	A	A	A	B	A	B	A	A
		50	50	A	A	A	A	A	A	B	A	B	A	A
		sat.	100	A	A	A	A	A	A	B	A	B	A	A
Ferric-(II)-Sulfate	$FeSO_4 \cdot {}_7H_2O$	10	rt	A	A	A	A	A	A	B	A	B	A	A

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		all	b	A	A	A	A	A	A	B	A	B	A	A
Ferric-(III)-Chloride	$FeCl_3$	5	25	A	A	A	A	A	A	B	A	B	A	A
		10	65	A	A	A	A	A	A	B	A	B	A	A
		15	25	A	A	A	A	A	A	B	A	B	A	A
		45	25	A	A	A	A	A	A	B	A	B	A	A
		50	50	A	A	A	A	A	A	B	A	B	A	A
		50	b	A	A	A	A	A	A	B	A	B	A	A
Ferric-(III)-Sulfate	$Fe(SO_4)_3$		rt	A	A	A	A	A	A	B	A	B	A	A
		til 30	til 65	A	A	A	A	A	A	B	A	B	A	A
Flourosilic acid	H_2SiF		rt	A	B	A	A	A			A	A		
Formaldehyde	CH_2O	30	30	A	C	A	A	A			A	A		
		all	til b	A	A	A	A	A	A	B	A	A	A	A
Formic acid	HCOOH	10	rt	A	A	A	A	A	B	C	B	B	A	A
		10	65	A	A	A	A	A	B	C	B	B	A	A
		10	b	A	A	A	A	A	B	C	B	B	A	A
		20-40	65	A	A	A	A	A	B	C	B	B	A	A
		50	rt	A	A	A	A	A	B	C	B	B	A	A
		50	b	A	A	A	A	A	B	C	B	B	A	A
		60	65	A	A	A	A	A	B	C	B	B	A	A
		80	rt	A	A	A	A	A	B	C	B	B	A	A
		80	65	A	A	A	A	A	B	C	B	B	A	A
		80	b	A	A	A	A	A	B	C	B	B	A	A
		90	100	A	A	A	A	A	B	C	B	B	A	A
		conc.	rt	A	A	A	A	A	B	C	B	B	A	A
		conc.	b	A	A	A	A	A	B	C	B	B	A	A
Fuming sulfuric acid	$H_2S_2O_7$	10	rt	A	A	A	C	A	A	C	C	C	C	B
		10	b	A	A	A	C	A	A	C	C	C	C	B
		25	rt	A	A	A	C	A	A	C	C	C	C	B
		25	b	B	B	B	C	A	A	C	C	C	C	B
Furfuryl alcohol	$C_5H_4O_2$	25	b	A	A	A	A	A	C	C	C	A	A	A
		100	rt	A	A	A	A	A	C	C	C	A	A	A
		100	b	A	A	A	A	A	C	C	C	A	A	A
Glycerine	$CH_{2O}HCHOH$		rt	A	A	A	A	A	A	A	A	A	A	A
	CH_2OH		b	A	A	A	A	A	A	A	A	A	A	A
Hydrochloric acid	HCI	0,5	rt	A	A	A	A	A	A	C	B	B	B	A
		0,5	b	A	A	A	A	A	B	C	C	C	C	B
		5	rt	A	A	A	A	A	A	C	B	B	B	A
		5	60	A	A	A	A	A	A	C	B	B	B	A
		5	b	A	A	A	A	A	B	C	C	C	C	B
		10	rt	A	A	A	A	A	A	C	B	B	B	A
		10	50	A	A	A	A	A	A	C	B	B	B	A
		10	b	A	A	A	A	A	B	C	C	C	C	B
		15	rt	A	A	A	A	A	A	C	B	B	B	A
		15	b	A	A	A	A	A	B	C	C	C	C	B
		20	rt	A	A	A	A	A	A	C	B	B	B	A

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		20	b	A	A	A	A	A	B	C	C	C	C	B
		30	rt	A	A	A	A	A	A	C	B	B	B	A
		30	b	A	A	A	A	A	B	C	C	C	C	B
		37	rt	A	A	A	A	A	A	C	B	B	B	A
		37	b	A	A	A	A	A	B	C	C	C	C	B
Hydrocholoric acid + Nitric acid	HCI:HNO_3	3:1	rt	A	A	A	A	A	B	C	C	C	C	B
Hydrogen bromide	HBr		rt	A	A	A	A	A	A	C	B	C	A	A
Hydrogen bromide	HBr	0-50	b	A	A	A	A	A	A	C	B	C	A	A
Hydrogen cyanide	HCN		rt	A	A	A	A	A	A	B	B	B	B	A
Hydrogen flouride	HF	1	rt	A	C	A	A	A	A	C	B	B	B	A
		40	rt	A	C	A	A	A	A	C	B	B	B	A
		40	50	A	C	A	A	A	A	C	C	C	C	B
		50	rt	A	C	A	A	A	A	C	B	B	B	A
		100	rt	A	C	A	C	A	A	C	C	C	C	A
		100	b	A	C	B	C	A	A	C	C	C	C	B
Hydrogen sulfide	H_2S		rt	A	A	A	A	A	A	C	B	C	A	A
			100	A	A	A	A	A	A	C	C	C	A	A
Lactic acid	$H_6C_3O_3$	1,5	rt	A	A	A	A	A	B	B	B	C	B	B
		1,5	b	A	A	A	A	A	B	B	B	C	B	B
		10	rt	A	A	A	A	A	B	B	B	C	B	B
		10	b	A	A	A	A	A	B	B	B	C	B	B
		conc.	b	A	A	A	A	A	B	B	B	C	B	B
Lead acetate	$C_4H_6O_4Pb$	all	rt	A	A	A	A	A	A	A	A	A	A	A
Magnesium chloride	$MgCl_2$	10	rt	A	A	A	A	A	A	B	A	A	A	A
		20	b	A	A	A	A	A	A	B	A	A	A	A
		30	rt	A	A	A	A	A	A	B	A	A	A	A
		42	b	A	A	A	A	A	A	B	A	A	A	A
Magnesium sulfate	$MgSO_4$	10	rt	A	A	A	A	A	A	B	A	A	A	A
		25		A	A	A	A	A	A	B	A	A	A	A
		50		A	A	A	A	A	A	B	A	A	A	A
		sat.		A	A	A	A	A	A	B	A	A	A	A
Maleic acid	$C_4H_4O_4$	10	til 80	A	A	A	A	A	C	C	A	B	B	A
		10	b	A	A	A	A	A	C	C	A	B	B	A
		50	100	A	A	A	A	A	C	C	A	B	B	A
Malic acid	$C_4H_6O_5$	til 50	rt	A	A	A	A	A	A	A	A	A	A	A
			b	A	A	A	A	A	A	A	A	A	A	A
Manganese chloride	$MnCl_2$	5	100	A	A	A	A	A	A		A	A		
		20	100	A	A	A	A	A	A		A	A		
		50	100	A	A	A	A	A	A		A	A		
Manganese sulfate	$MnSO_4$	all	rt	A	A	A	A	A	A		A	A		
Mercury	Hg		20	A	A	A	A	A	A	A	A	A	A	A
			50	A	A	A	A	A	A	A	A	A	A	A
			b	A	A	A	C							
Methanol	CH_3OH	all	rt	A	A	A	A	A	C	B	A	A	A	A

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		all	b	A	A	A	A	A	C	B	A	A	A	A
Methylene chloride	CH_2Cl_2		rt - b	A	A	A	A	A	B	C	C	C	C	C
Monochloro acetic	CH_2ClCO_2H	50	rt	A	A	A	A	A	C	C	C	C	B	B
		70	b	A	A	A	A	A	C	C	C	C	B	B
		100	rt	A	A	A	A	A	C	C	C	C	B	B
		100	b	A	A	A	A	A	C	C	C	C	B	B
Naphta	$C_{10}H_8$		rt	A	A	A	A	A	B	C	C	C	C	C
Nickel chloride	$NiCl_2 \cdot {}_6H_2O$	10	60	A	A	A	A	A	A	A	A	A	A	A
		10	b	A	A	A	A	A	A	A	A	A	A	A
		20	rt	A	A	A	A	A	A	A	A	A	A	A
		30	b	A	A	A	A	A	A	A	A	A	A	A
		80	95	A	A	A	A	A	A	A	A	A	A	A
Nickel nitrate	$Ni(NO_3)_2 \cdot 6H_2O$		rt	A	A	A	A	A	A	A	A	A	A	A
Nickel sulfate	$NiSO_4 \cdot 7H_2O$		80	A	A	A	A	A	A	A	A	A	A	A
Nitric acid	HNO_3	7	rt	A	A	A	A	A	B	C	C	C	C	B
		7	b	A	A	A	B	A	B	C	C	C	C	B
		10	rt	A	A	A	A	A	B	C	C	C	C	B
		10	b	A	A	A	C	A	B	C	C	C	C	B
		25	rt	A	A	A	B	A	B	C	C	C	C	B
		25	b	A	A	A	C	A	B	C	C	C	C	B
		37	rt	A	A	A	C	A	B	C	C	C	C	B
		37	b	A	A	A	C	A	B	C	C	C	C	B
		50	rt	A	A	A	C	A	B	C	C	C	C	B
		50	b	A	A	A	C	A	B	C	C	C	C	B
		65	rt	A	A	A	C	A	B	C	C	C	C	B
		65	b	A	A	A	C	A	B	C	C	C	C	B
		70	100	A	A	A	C	A	B	C	C	C	C	B
	Fuming	100	rt				C	A	B	C	C	C	C	B
		100	50-70				C	A	B	C	C	C	C	B
		100	b				C	A	B	C	C	C	C	B
Nitrobenzene				A	A	A	A	A	A	A	A	A	A	A
Oxalic acid	$H_2C_2O_4$	5	rt	A	A	A	A	A	A	A	A	B	A	A
		5	b	A	A	A	A	A	A	A	A	B	A	A
		10	rt	A	A	A	A	A	A	A	A	B	A	A
		10	b	A	A	A	A	A	A	A	A	B	A	A
		25	rt	A	A	A	A	A	A	A	A	B	A	A
		25	b	A	A	A	A	A	A	A	A	B	A	A
		50	rt	A	A	A	A	A	A	A	A	B	A	A
		50	b	A	A	A	A	A	A	A	A	B	A	A
		sat.	rt	A	A	A	A	A	A	A	A	B	A	A
		sat.	b	A	A	A	A	A	A	A	A	B	A	A
Ozone	O_3	liquid		A	A	A	C	A	A	C	B	C	A	A
Percholoro ethylene	C_2Cl_4		rt	A	A	A	A	A	B	C	C	C	C	C
			b	A	A	A	A	A	B	C	C	C	C	C
Phenol	C_6H_5OH	pure	rt	A	A	A	A	A	B	C	C	C	C	C

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
			b	A	A	A	A	A	B	C	C	C	C	C
Phosphorous acid	H_3PO_4	1	rt	A	A	A	A	A	A	B	A	A	A	A
		1	b	A	A	A	A	A	A	C	A	A	A	A
		1	140	A	A	A	A	A	A	C	A	A	A	A
		10	rt	A	A	A	A	A	A	B	A	A	A	
		10	b	A	A	A	A	A	A	C	A	A	A	A
		30	rt	A	A	A	A	A	A	B	A	A	A	A
		30	b	A	A	A	A	A	A	C	A	A	A	A
		45	rt	A	A	A	A	A	A	B	A	A	A	A
		45	b	A	A	A	A	A	A	C	A	A	A	A
		80	rt	A	A	A	A	A	A	B	A	A	A	A
		80	60	A	A	A	A	A	A	C	A	A	A	A
		80	b	B	B	B	A	A	A	C	A	A	A	A
		90	rt	A	A	A	A	A	A	B	A	A	A	A
		90	b	B	B	B	C	A	A	C	A	A	A	A
		conc.	rt	A	A	A	A	A	A	B	A	A	A	A
		conc.	b	C	C	C	C	A	A	C	A	A	A	A
Potassium choloride	KCI	10	rt	A	A	A	A	A	A	A	A	A	A	A
		10	b	A	A	A	A	A	A	A	A	A	A	A
		20	b	A	A	A	A	A	A	A	A	A	A	A
		30	b	A	A	A	A	A	A	A	A	A	A	A
		sat.	100	A	A	A	A	A	A	A	A	A	A	A
Potassium cyanide	KCN	10	rt	A	A	A	A	A	B	C	A	B	A	A
Potassium hydroxide	KOH	10	rt	A	A	A	A	A	C	B	A	A	A	A
		10	b	A	A	A	A	A	C	B	A	A	A	A
		20	rt	A	A	A	A	A	C	B	A	A	A	A
		20	b	A	A	A	A	A	C	B	A	A	A	A
		28	rt	A	A	A	A	A	C	B	A	A	A	A
		28	b	A	A	A	A	A	C	B	A	A	A	A
		40	til b	A	A	A	B	A	C	B	A	A	A	A
		50	rt	A	A	A	A	A	C	B	A	A	A	A
		50	b	B	A	B	C	A	C	B	A	A	A	A
Potassium hypochlorite	KOCl	20g Cl/l	til 40	A	A	A	A	A	A	C	C	C		
		130g	rt	A	A	A	A	A	A	C	C	C		
		130g	150	A	A	A	C	A	A	C	C	C		
Potassium nitrate	KNO_3	25	rt	A	A	A	A	A	A	A	A	A	A	A
		25	b	A	A	A	A	A	A	A	A	A	A	A
		40	rt	A	A	A	A	A	A	A	A	A	A	A
		40	b	A	A	A	A	A	A	A	A	A	A	A
		50	rt	A	A	A	A	A	A	A	A	A	A	A
		50	b	A	A	A	A	A	A	A	A	A	A	A
		sat.	rt	A	A	A	A	A	A	A	A	A	A	A
		sat.	b	A	A	A	A	A	A	A	A	A	A	A
Potassium perchlorate	$KClO_4$	25	25	A	A	A	A	A			A	A		
		50	25	A	A	A	A	A			A	A		

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		75	25	A	A	A	A	A			A	A		
Potassium permanganate	$KMnO_4$	all	rt	A	A	A	A	A			A	A		
		all	b	A	A	A	A	A			A	A		
Potassium sulfate	K_2SO_4	10	rt	A	A	A	A	A	A	A	A	A	A	A
		20	til 50	A	A	A	A	A	A	A	A	A	A	A
Prussiate of potash	KCN	10	rt	A	A	A	A	A	B	C	A	B	A	A
Pyridine	C_5H_5N	50	rt-60	A	A	A	A	A	C	C	C	C	C	B
		100	rt-60	A	A	A	A	A	C	C	C	C	C	B
Salt water			rt	A	A	A	A	A	A	A	A	A	A	A
Sodium bicarbonate	$NaHCO_3$	10	til b	A	A	A	A	A	B	B	A	A	A	A
		20	40-b	A	A	A	A	A	B	B	A	A	A	A
		all	all	A	A	A	A	A	B	B	A	A	A	A
Sodium bisulfate	$NaHSO_4$	10	rt	A	A	A	A	A			A	A		
		10	b	A	A	A	A	A			A	A		
		sat.	rt	A	A	A	A	A			A	A		
		sat.	b	A	A	A	A	A			A	A		
Sodium bisulfite	$NaHSO_3$	50	rt	A	A	A	A	A			A	A		
				A	A	A	A	A			A	A	A	A
Sodium carbonate	Na_2CO_3	10	b	A	A	A	C	A	C	B	A	A	A	A
		20	rt	A	A	A	A	A	C	B	A	A	A	A
		20	50-b	A	A	A	A	A	C	B	A	A	A	A
		50	rt	A	A	A	A	A	C	B	A	A	A	A
		50	b	A	A	A	A	A	C	B	A	A	A	A
		sat.	rt	A	A	A	A	A	C	B	A	A	A	A
		sat.	b	A	A	A	C	A	C	B	A	A	A	A
Sodium chlorate	$NaClO_3$	5	rt	A	A	A	A	A	A	A	A	A	A	A
		5	b	A	A	A	A	A	A	A	A	A	A	A
Sodium chloride	NaCl	3.5	rt	A	A	A	A	A	A	A	A	A	A	A
		3.5	b	A	A	A	A	A	A	A	A	A	A	A
Sodium chloride solution		techn.	rt	A	A	A	A	A	A	A	A	A	A	A
			b	A	A	A	A	A	A	A	A	A	A	A
Sodium chlorite	$NaClO_2$	5	rt	A	A	A	C	A			C	C		
		5	b	A	A	A	C	A			C	C		
		10	rt	A	A	A	C	A			C	C		
Sodium hydroxide	NaOH	10	rt	A	A	A	A	A	C	B	A	A	A	A
(Caustic soda)		10	b	A	A	A	A	A	C	B	A	A	A	A
		20	rt	A	A	A	A	A	C	B	A	A	A	A
		20	b	A	A	A	C	A	C	B	A	A	A	A
		34	rt	A	A	A	C	A	C	B	A	A	A	A
		34	b	A	A	A	C	A	C	B	A	A	A	A
		50	rt	A	A	A	C	A	C	B	A	A	A	A
		50	b	B	A	B	C	A	C	B	A	A	A	A
		60	b	B	A	B	C	A	C	B	A	A	A	A
		70	b	C	B	C	C	A	C	B	A	A	A	A

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neopren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
Sodium hypochlorite	NaOCl	10g Cl/l	rt	A	A	A	A	A	A	C	C	C	C	A
(Bleaching soda)		10g Cl/l	50	A	A	A	A	A	A	C	C	C	C	A
		20g Cl/l	rt	A	A	A	A	A	A	C	C	C	C	A
		20g Cl/l	40	A	A	A	A	A	A	C	C	C	C	A
		120g	rt	A	A	A	A	A	A	C	C	C	C	A
		120g	b	A	A	A	A	A	A	C	C	C	C	A
Sodium nitrate	$NaNO_3$		rt	A	A	A	A	A	A	A	A	A	A	A
			100	A	A	A	A	A	A	A	A	A	A	A
Sodium nitrite	$NaNO_2$		70	A	A	A	A	A	A	A	A	A	A	A
			100	A	A	A	A	A	A	A	A	A	A	A
Sodium peroxide	Na_2O_2	10	rt	A	A	A	A	A			A	A		
		10	b	A	A	A	C	A			A	A		
Sodium sulfate	$Na_2SO_4 \cdot 10H_2O$	sat.	rt	A	A	A	A	A	A	C	B	C	A	A
		sat.	b	A	A	A	A	A	A	C	B	C	A	A
Sodium sulfide	$Na_2S \cdot 9H_2O$	25	rt	A	A	A	A	A	A	C	B	C	A	A
		25	b	A	A	A	A	A	A	C	B	C	A	A
		50	rt	A	A	A	A	A	A	C	B	C	A	A
		50	b	A	A	A	A	A	A	C	B	C	A	A
		sat.	rt	A	A	A	A	A	A	C	B	C	A	A
Sodium sulfite	$Na^2SO^3 \cdot 7H^2O$	25	rt	A	A	A	A	A	A	C	B	C	A	A
		25	b	A	A	A	A	A	A	C	B	C	A	A
		50	rt	A	A	A	A	A	A	C	B	C	A	A
		50	b	A	A	A	A	A	A	C	B	C	A	A
Sodium thiol	$Na_2S_2O_3 \cdot 5H_2O$	25	rt	A	A	A	A	A	A	C	B	C	A	A
		25	b	A	A	A	A	A	A	C	B	C	A	A
Spinning bath	til 10% H_2SO_4		70	A	A	A	A	A	A	C	A	B	A	A
	over 10% H_2SO_4		70	A	A	A	A	A	A	C	A	B	A	A
Stearic acid	$C_{17}H_{35}COOH$	techn.	100	A	A	A	A	A	A	A	B	C	C	C
		techn.	150	A	A	A	A	A	A	A	B	C	C	C
		100	rt	A	A	A	A	A	A	A	B	C	C	C
		100	b	A	A	A	A	A	A	A	B	C	C	C
		100	135	A	A	A	A	A	A	A	B	C	C	C
		100	315	A	A	A	C							
Sulfur chloride	S_2Cl_2		rt	A	A	A	A	A	C	C	C	C	C	C
			b	A	A	A		A	C	C	C	C	C	C
Sulfuric acid	H_2SO_4	2	rt	A	A	A	A	A	A	A	A	A	A	A
		2	b	A	A	A	A	A	A	C	A	B	A	A
		5	rt	A	A	A	A	A	A	A	A	A	A	A
		5	b	A	A	A	A	A	A	C	A	B	A	A
		10	rt	A	A	A	A	A	A	C	C	C	B	A
		10	b	A	A	A	A	A	A	C	C	C	C	B
		25	rt	A	A	A	A	A	A	C	C	C	B	A
		25	b	A	A	A	A	A	A	C	C	C	C	B
		50	rt	A	A	A	A	A	A	C	C	C	B	A
		50	b	A	B	A	A	A	A	C	C	C	C	B

Agent	Chemical formula	Conc. (%)	Temp. (°C)	Oxide ceramics			Graphite impregna-ted	PTFE	Viton	Perbu-nan	Neo-pren	Neutral rubber	Butyl rubber	Hypalon
				F99.7 AL23	FZM FZM+	FZT								
		60	rt	A	A	A	A	A	A	C	C	C	B	A
		60	b	A	B	A	A	A	A	C	C	C	C	B
		77	rt	A	A	A	A	A	A	C	C	C	B	B
		77	b	B	C	B	C	A	A	C	C	C	C	C
		80	rt	A	A	A	A	A	A	C	C	C	B	B
		80	b	B	C	B	C	A	A	C	C	C	C	C
		85	rt	A	A	A	A	A	A	C	C	C	B	B
		85	b	B	C	B	C	A	A	C	C	C	C	C
		90	rt	A	A	A	B	A	A	C	C	C	B	B
		90	b	B	C	B	C	A	A	C	C	C	C	C
		96	rt	A	A	A	B	A	A	C	C	C	B	B
		96	b	B	C	B	C	A	A	C	C	C	C	C
Sulfuric acid	H_2SO_3	sat.	rt	A	A	A	A	A	A	B	B	B	B	A
Sulfuric acid + nitric acid	H_2SO_4:HNO_3	10:90	35	A	A	A	C	A	B	C	C	C	C	B
		30:70	35	A	A	A	C	A	B	C	C	C	C	B
		50:50	35	A	A	A	C	A	B	C	C	C	C	B
		60:40	35	A	A	A	C	A	B	C	C	C	C	B
		70:30	35	A	A	A	C	A	B	C	C	C	C	B
		80:20	35	A	A	A	A	A	A	C	C	C	C	B
		90:10	35	A	A	A	A	A	A	C	C	C	C	B
		99:1	35	A	A	A	A	A	A	C	C	C	C	B
Tannic acid	$C_{76}H_{52}O_{44}$	10	rt	A	A	A		A	A	C	B	B	B	A
		10	b	A	A	A		A	A	C	B	B	B	A
		50	50	A	A	A		A	A	C	B	B	B	A
		50	b	A	A	A		A	A	C	B	B	B	A
Tartaric acid	$C_4H_6O_6$	all	rt	A	A	A	A	A	A	A	A	A	A	A
		all	b	A	A	A	A	A	A	A	A	A	A	A
Tin chloride	$SnCl_2$, $SnCl_4$	all	rt	A	A	A	A	A	A	A	A	A	A	A
		all	150	A	A	A	A	A	A	A	A	A	A	A
Trichloro ethylene	$CHCl=CCl_2$		rt	A	A	A	A	A	B	C	C	C	C	C
Uric acid	$C_5H_4N_4O_3$		rt	A	A	A	A	A	A	A	A	A	A	A
Zinc chloride	$ZnCl_2$	10	rt	A	A	A	A	A	A	B	A	B	A	A
		10	b	A	A	A	A	A	A	B	A	B	A	A
		20	rt	A	A	A	A	A	A	B	A	B	A	A
		20	b	A	A	A	A	A	A	B	A	B	A	A
		60	rt	A	A	A	A	A	A	B	A	B	A	A
		60	b	A	A	A	A	A	A	B	A	B	A	A
		100	b	A	A	A	C	A	A	B	A	B	A	A

ABOUT KYOCERA





The global Kyocera corporation - a strong partner.

Headquarters:	Kyoto, Japan
Foundation:	1959
Employees:	over 80,000 worldwide
European headquarters:	Esslingen, Germany
European production sites:	Mannheim, Germany Selb, Germany Erfurt, Germany (further subsidiaries in Europe)

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KYOCERA – it all began with ceramics

KYOCERA Fineceramics Europe GmbH is a subsidiary of KYOCERA Europe GmbH, which has been successful in Europe for over 50 years. The Kyocera Group is one of the world's leading providers of high-performance ceramic components for the technology industry, offering over 200 different ceramic materials, as well as state-of-the-art technologies and services tailored to the specific needs of each market.

KYOCERA Fineceramics Europe GmbH has grown steadily in recent years – and is now one of the leading European suppliers of customised solutions made of technical ceramics. Working in partnership, we develop and manufacture products that offer our customers added value in their respective markets and secure their technological lead in the long term. We are committed to this every day.

We have also been active in the field of environmental technology for 30 years. Our solutions for treatment of exhaust air and waste water from chemical laboratories and industrial processes are known worldwide under the FRIDURIT brand.

Throughout Europe, we are represented by three production and development sites in Mannheim, Selb and Erfurt (Germany), as well as five sales offices – in Mannheim, Selb, Neuss (Germany), Rungis (France) and Frimley (United Kingdom).

Our business partners benefit from the fact that we think and work across divisions within the Kyocera Group. Because innovations and real milestones can only be achieved together – across industries and national borders.

This is what we believe.

About the KYOCERA Group

KYOCERA Europe GmbH is a company of the KYOCERA Corporation headquartered in Kyoto/Japan, a renowned supplier for semiconductor, industrial and automotive components as well as electronic components, printing and multifunction systems, and communications technology. The technology group is one of the world's most experienced manufacturers of smart energy systems, with more than 45 years of industry expertise. The Kyocera Group comprises of around 300 subsidiaries.

Kyocera aims to create a better future for the world, using the power of technology to solve issues we face as a global society. This ambition is rooted in our Kyocera Management Rationale: to contribute to the advancement of society and humankind.

We will continue to work together with people around the world to solve issues critical to society leveraging all of the technologies and management capabilities we have accumulated during our 60-plus year history.

The company also takes an active interest in cultural affairs. The Kyoto Prize, a prominent international award, is presented each year by the Inamori Foundation established by Kyocera founder Dr Kazuo Inamori to individuals worldwide who have contributed significantly to the scientific, cultural, and spiritual betterment of humankind.



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