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## COATING PHYSICAL AND CHEMICAL PROPERTIES



# ➤ Physical properties of the coatings

## Typical results for coating applied according to Arkema specifications

<b>Melting point</b>	ISO 11357	186 °C	<b>Latent heat of fusion</b>	83,7 kJ/kg
<b>VICAT point</b>	ISO 306	181°C	<b>Surface resistivity</b>	ASTM D 257 2.4 x 10 <sup>14</sup> Ω at 20°C and 65% RH at 500 V
<b>Specific gravity at 20°C</b>	ISO 1183		<b>Inflammability</b>	ASTM D 635 self-extinguishing measured at a thickness greater than 3 mm to eliminate the influence of the substrate
natural powders		1.040 g/cm <sup>3</sup>		
dipping and ES powders, white		1.065 g/cm <sup>3</sup> to 1.25 g/cm <sup>3</sup>		
<b>Water absorption to saturation</b>	ISO 62/1		<b>Dielectric constant</b>	102 Hz 3.9 106 Hz 3.1
at 20°C and 65% RH		0.9 to 1.1% according to the type of powder		
at 20°C and 100% RH		1.6 to 1.9% according to the type of powder	<b>Transverse or volume resistivity</b>	ASTM D 257 10 <sup>14</sup> to 10 <sup>16</sup> Ω.cm at 20°C and 65% RH at 500 V
at 100°C and 100% RH (boiling water)		2.4 to 3% according to the type of powder	<b>Tangent of the angle of loww (power factor)</b>	0.05 at 1,000 V R.M.S., with a current of 1,000 Hz (at 20°C and 65% RH)
<b>Shore D hardness</b>	ISO 868	75-85	<b>Resistance to surface tracking</b>	DIN 53-480 Grade KA3c KA method
at 20°C, measured at a thickness greater than 5 mm to eliminate the influence of the substrate			<b>Dielectric rigidity</b>	ASTM D 149 55 to 90 kV/mm ES powders thickness ± 100 µm Dipping powders, thickness 350 to 450 µm 30 to 36 kV/MM
<b>Hardness measured with a Persoz pendulum</b>	ISO 1522	180-200	<b>Dielectric strength</b>	Influence of the thickness studied on a natural coating (measured at 20°C and 65% RH)
at 20°C			0.20 mm 52.8 kV/mm 0.43 mm 38.4 kV/mm 0.70 mm 34.7 kV/mm 0.90 mm 33.1 kV/mm	
<b>Surface hardness</b>	DIN 53-456	80 N/mm <sup>2</sup>	<b>Resistance to boiling water</b>	ISO 1521 Excellent adhesion after 2,000 hours; neither bubbling nor modification
at 20°C 10 sec. under load			<b>Resistance to outdoor exposure</b>	ASTM D 1235 3 years Florida exposure: Adhesion 4, NFT 58-112 without any corrosion
<b>Scratch resistance</b> measured with the Clemen apparatus; load necessary to induce a scratch which reaches the underlying metal for a coating of 0.4 mm thickness	ISO 1518	59 N	<b>Resistance to salt water</b>	No corrosion after 10 years exposure
<b>Pencil hardness</b>	ECCA T4	Note: B	<b>Salt spray resistance</b>	ISO 9227, < 1 mm corrosion on scribed primed plates (testing according to WIS 4-52-01)
<b>Shear strength</b>	ASTM D 732	35-42 N/mm <sup>2</sup>		
<b>Impact resistance</b>				
Dip coating powder (thickness 350 µm)	ASTM G14	> 2 J		
ES powders (thickness 100 µm)	ISO 3678	> 2.5 J		
	ISO 6272	> 19 J		
<b>Abrasion resistance</b>				
Taber abrasimeter (wheel type CS 17, load 1 kg) loss of weight after 1,000 cycles	ISO 9352	15 mg		
<b>Coefficient of friction</b>	NFT 54-112 (8)	Static K: 0.15-0.3 Dynamic K: 0.05-0.2		
Black powders				
<b>Flexibility</b>				
Conical mandrel folding	ISO 6860	> 35%		
<b>Specific heat</b>		2.09 J/kg K		
<b>Thermal conductivity</b>		0.29 W/mK between 323 and 443 K (50° and 170°C)		

# ➤ Chemical properties of the coatings

## Resistance of Rilsan® to various chemicals, as a function of temperature

*In general, Rilsan® coatings have good resistance to inorganic salts, alkalis, most solvents, and to organic acids. Greater caution must be observed in uses involving inorganic acids, phenols and certain chlorinated solvents. In such cases, it is advisable to consult the Arkema Technical Service Department, specifying the practical problem involved: e.g nature of metal to be protected and the temperature and chemical composition of the liquid.*

Resistance (°C)	20	40	60	90
<b>Inorganic bases</b>				
ammonium hydroxide (concentrated)	G	G	G	G
ammonia (liquid or gas)	G	G		
lime-wash		G	G	G
potassium hydroxide (50%)	G	L	P	P
sodium hydroxide (5%)	G	G	L	
sodium hydroxide (10%)	G	L	L	
sodium hydroxide (50%)	G	L	P	P
<b>Inorganic acids</b>				
chromic acid (10%)	P	P	P	P
hydrochloric acid (1%)	G	L	P	P
hydrochloric acid (10%)	G	L	P	P
nitric acid (all concentrations)	P	P	P	P
phosphoric acid (50%)	G	L	P	P
sulphuric acid (1%)	G	L	L	P
sulphuric acid (10%)	G	L	P	P
sulphuric trioxide	L	P	P	P
<b>Inorganic salts</b>				
alum	G	G	G	
aluminium sulphate	G	G	G	G
ammonium nitrate	G	G	G	
ammonium sulphate	G	G	L	
barium chloride	G	G	G	G
calcium arsenate (concentrated solutions of slurries)	G	G	G	
calcium chloride	G	G	G	G
calcium sulphate	G	G	L	
copper sulphate	G	G	G	G
diammonium phosphate	G	G	L	
magnesium chloride (50%)	G	G	G	G
potassium ferrocyanide	G	G	G	
potassium nitrate	G1	G <sup>1</sup>	P	P
potassium sulphate	G	G	G	G
sodium carbonate	G	G	L	P
sodium chloride (saturated)	G	G	G	G
sodium silicate	G	G	G	
sodium sulphide	G	L	L	
trisodium phosphate	G	G	G	G

Resistance (°C)	20	40	60	90
<b>Other inorganic products</b>				
agricultural sprays	G	G		
bleach solution	L	P	P	P
bromine	P	P		
chlorine	P	P	P	P
fluorine	p	p	p	p
hydrogen	G	G	G	G
hydrogen peroxide (20 volumes)	G	L		
mercury	G	G	G	G
oxygen	G	G	L	P
ozone	L	P	P	P
potassium permanganate (5%)	P	P		
sea water	G	G	G	
soda water	G	G	G	G
sulphur	G	G		
water	G	G	G	G
<b>Adehydes and ketones</b>				
acetaldehyde	G	L	P	
acetone (pure)	G	G <sup>3</sup>	L	P
benzaldehyde	G	L	P	
cyclohexanone	G	L	P	
formaldehyde (technical)	G	L	P	
methylethylketone	G	G	L	P
methylisobutylketone	G	G	L	P
<b>Hydrocarbons</b>				
acetylene	G	G	G	G
benzene	G	G <sup>2</sup>	L	
butane	G	G	G	
cyclohexane	G	G	L	
decalin	G	G	G	L
HFA (Forane®)	G			
hexane	G	G	G	
methane	G	G	G	
naphthalene	G	G	G	L
propane	G	G	G	
styrene	G	G <sup>3</sup>		
toluene	G	G <sup>3</sup>	L	L
xylene	G	G <sup>3</sup>	L	L

Resistance (°C)	20	40	60	90
<b>Organic bases</b>				
aniline (pure)	L	P	P	P
diethanolamine (20%)	G	G <sup>3</sup>	G <sup>3</sup>	L
pyridine (pure)	L	P	P	P
urea	G	G	L	L
<b>Organic acids and anhydrides</b>				
acetic acid	L	P	P	P
acetic anhydride	L	P	P	P
citric acid	G	G	L	P
formic acid	P	P	P	P
lactic acid	G	G	G	L
oleic acid	G	G	G	L
oxalic acid	G	G	L	P
picric acid	L	P	P	P
stearic acid	G	G	G	L
tartaric acid (saturated solution)	G	G	G	L
uric acid	G	G	G	L
<b>Various organic compounds</b>				
anethole	G			
carbon disulphide	G3	L <sup>2</sup>	P	
diacetone alcohol	G	G <sup>3</sup>	L	P
dimethyl formamide	G	G	L	
ethylene chlorhydrin	P	P		
ethylene oxyde	G	G	L	P
furfurol	G	G <sup>3</sup>	L	P
glucose	G	G	G	G
tetraethyl lead	G			
tetrahydrofurane	G	G	L	
<b>Salts, esters, ethers</b>				
amyl acetate	G	G	G	L
butyl acetate	G	G	G	L
diethyl ether	G			
diethylphosphate	G	G	G	L
diethylphthalate	G	G	G	L
ethyl acetate	G	G	G	
fatty acid esters	G	G	G	G
methyl acetate	G	G	G	
methyl sulfate	G	L		
tributylphosphate	G	G	G	L
tricesylphosphate	G	G	G	L

Condition after 18 months contact: G: Good - L: Limited - P: Poor
1: Slight yellowing - 2: Yellowing - 3: Swelling action
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Resistance (°C)	20	40	60	90
<b>Alcohols</b>				
benzyl alcohol	L	P	P	P
butanol	G <sup>3</sup>	L	P	
ethanol (pure)	G <sup>3</sup>	G	L	
glucerine (pure)	G	G	L	P
glycol	G	G	G	P
methanol (pure)	G <sup>3</sup>	L	P	
<b>Chlorinated solvents</b>				
carbon tetrachloride		P		
methyl bromide		G	P	
methyl chloride		G	P	
perchloroethylene		G	G	L
trichloroethane		L	P	
trichloroethylene		G	L	
<b>Phenols</b>				
beet		G		
cider		G		
crude petroleum		G	G	G <sup>3</sup>
diesel fuel		G	G	G <sup>3</sup>
fruit juices		G	G	
fuel-oil		G	G	G
greases		G	G	G
ground-nut oil		G	G	
high octane petrol		G	G	G <sup>3</sup>
ketosene (paraffin)		G	G	G <sup>3</sup>
linseed cake		G	G	G
milk		G	G	G
mustard		G		
normal petrol		G	G	G <sup>3</sup>
oils		G	G	G
solutions or emulsions D.D.T. or lindane				
hydroxy-quionoline (agricultural sprays)		G		
soap solution		G		
stearin		G	G	G
solvent naphtha		G	G	G <sup>3</sup>
town gas		G	G	
turpentine		G	G	G <sup>3</sup>
winegar		G		
wine		G		

A world-class chemical concern, Arkema combines three strategically related, integrated businesses: Vinyl Products, Industrial Chemicals and Performance Products. With operations in more than 40 countries and 17,700 employees, the company reported revenue of € 5.7 billion in 2005. Leveraging six research centers in France, the United States and Japan and internationally recognized brands, Arkema holds leadership positions in each of its principal markets.

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