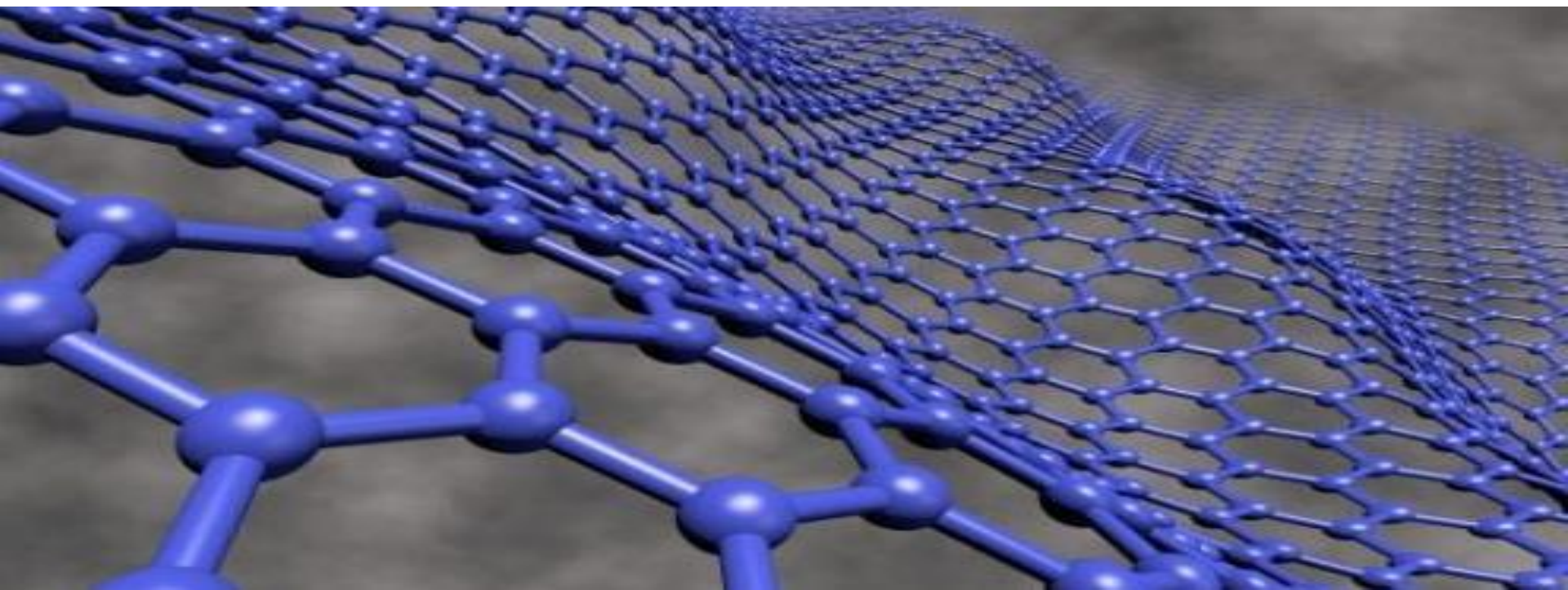




The Sixth Element Inc.

# Technical information Corrosion protection with graphene



**The Sixth Element  
(Changzhou) Materials Technology Co., Ltd.**



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Featuring SE1132

## Solvent based anti-corrosion 2k-epoxy system

Salt spray test (NaCl (50 g  $\pm$  5 g/l); 35  $\pm$  2°C) – > 3000 hours

Dry film thickness 50  $\mu$ m



77 % zinc

25 % zinc (particle size: D50 13  $\mu$ m) + 1 % graphene  
SE1132

Weight % in relation to dry substance

Weight % in relation to dry substance

patent protected – patent owner The Sixth Element (Changzhou) Materials Technology

According ISO7253: 1996 - IDT

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# Solvent based anti-corrosion 2k-epoxy system

## Examples for formulations

### Using solvent based graphene suspension

Part A		parts	Part B	
1	Epoxy Dow 671 (pure Epoxy)	18,20	Sunmide 305-70X	100
2	Solvent (xylene /butanol)	15,00		
3	Organic Bentonite	2,50		
4	Polyamid wax	1,00		
5	10 % Graphene suspension in Xylene	6,70		
6	Zinc powder - D50 5 µm	24,58		
7	Barium sulphate	5,40		
8	Mica Powder	17,90		
9	Aluminiumhydroxid	4,48		
10	Adhesion promotor	1,00		
11	Talc	7,10		
	total	103,86		

#### Procedure:

Charge items 1 and 2, and mix to get homogenous system

Charge items 3 and 4, and mix to get homogenous system

Charge item 5 and mix to get homogenous system

Charge items 6, 7, 8, 9, 10 and 11, and mix to get homogenous system, then get part A

Blending ratio part A to part B: 12 to 1



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# Solvent based anti-corrosion 2k-epoxy system Examples for formulations

### Using epoxy graphene composites

Part A		parts	Part B	
1	Epoxy Dow 671 (pure Epoxy)	12,83	Sunmide 305-70X	100
2	Solvent (xylene /butanol)	20,00		
3	Organic Bentonite	2,50		
4	Polyamid wax	1,00		
5	Epoxy / Graphene suspension 10 % - same epoxy as above	6,71		
6	Zinc powder - D50 5 µm	24,58		
7	Barium sulphate	5,40		
8	Mica Powder	17,90		
9	Adhesion promotor	1,00		
10	Alumiumum Hydroxid	4,48		
11	Talc	7,10		
	total	103,50		

#### Procedure:

Charge items 1 and 2, and mix to get homogenous system

Charge items 3 and 4, and mix to get homogenous system

Charge item 5 and mix to get homogenous system

Charge items 6, 7, 8, 9, 10 and 11, and mix to get homogenous system, then  
get part A

Blending ratio part A to part B: 12 to 1





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## Water-based anti-corrosion 2k-epoxy system

- 100  $\mu\text{m}$  dry film thickness - 45 % zinc powder dry film (particle size D50 – 13  $\mu\text{m}$ )
- 1 % SE1132 dry film- using e.g. Hexion Epicure® 8538-Y-38 technology

Waterbased

Salt Spray  
1440h

Waterbased

Salt Spray  
2400h



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# Water-based anti-corrosion 2k-epoxy system Examples for formulations

### Using graphene powder

Part A		parts	Part B	
1	Hardening agent	4,00	Epoxy suspension - 20 % epoxy by weight	100
2	Propyl glycol ether	0,50		
3	Isopronaol	5,00		
4	Organic Bentonite	1,00	Blending ratio part A to part B: 12 to 1	
5	Defoamer	0,50		
6	Leveling agent	0,50		
7	SE1132	0,86		
8	Dispersing agent	0,86		
9	Zinc powder 13 µm	39,00		
10	Talc	10,00		
11	Barium Sulfat	10,00		
	total	72,22		

#### Premix:

Charge items 1, 2 and 3 and mix to get homogenous system

Charge items 4, 5 and 6 and mix to get homogenous system

Charge item 7 and 8 and mix to get homogenous system

#### Pearl mill

Add 20 parts Zirconium beads (0.3 – 1.0 mm) to pearl mill

Add premix to pearl mill – grind for 2 hours – D50 < 2 µm, D90 < 4 µm

Separate beads from mixture

#### Mixing equipment

Add 9, 10 and 11 and mix to get homogenous system



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# Water-based anti-corrosion 2k-epoxy system Examples for formulations

### Using water-based graphene suspension

Part A			parts	Part B		
1	Hardening agent		4,00	1	Epoxy (pure resin)	20,00
2	Propyl glycol ether		0,50	2	Water	73,12
3	Isopronaol		5,00	3	10 % water-based Graphene suspension	8,60
4	Organic Bentonite		1,00			
5	Defoamer		0,50		Total	101,72
6	Leveling agent		0,50			
7	Zinc powder 13 µm		39,00			
8	Talc		10,00			
9	Barium Sulfat		10,00			
total			70,50			

#### Mix:

Charge items 1, 2 and 3 and mix to get homogenous system

Charge items 4, 5 and 6 and mix to get homogenous system

Charge item 7, 8 and 9 and mix to get homogenous system

Blending ratio part A to part B: 12 to 1



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## Solvent-based anti-corrosion 2k-epoxy system

70  $\mu\text{m}$  dry film thickness – 33,5 % zinc powder (particle size D50 – 5 $\mu\text{m}$ ) dry film  
0.45 % SE1233 dry film







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## Featuring SE1233

# Solvent based anti-corrosion 2k-epoxy system Examples for formulations

### Using epoxy graphene composites

	Part A	parts	Part B	
1	Epoxy Dow 671 (pure Epoxy)	11,00	Sunmide 305-70X	100
2	Solvent (xylene /butanol)	20,00		
3	Organic Bentonite	2,50		
4	Polyamid wax	1,00		
5	Epoxy / Graphene suspension 5 % - same epoxy as above	8,00		
6	Zinc powder - D50 5 µm	30,00		
8	Barium sulphate	7,50		
9	Mica Powder	2,50		
10	Adhesion promotor	1,00		
11	Talc	20,00		
	total	103,50		

#### Procedure:

Charge items 1 and 2, and mix to get homogenous system

Charge items 3 and 4, and mix to get homogenous system

Charge item 5 and mix to get homogenous system

Charge items 6, 7, 8, 9, 10 and 11, and mix to get homogenous system, then  
get part A

Blending ratio part A to part B: 12 to 1



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Featuring SE1233

# Solvent based anti-corrosion 2k-epoxy system

## Examples for formulations

### Using solvent based graphene suspension

	Part A	parts	Part B	
1	Epoxy Dow 671 (pure Epoxy)	18,2	Sunmide 305-70X	100
2	Solvent (xylene /butanol)	6,9		
3	Organic Bentonite	2,5		
4	Polyamid wax	1		
5	2 % Graphene suspension in Xylene	20		
6	Zinc powder - D50 5 µm	30		
8	Barium sulphate	7,5		
9	Mica Powder	2,5		
10	Adhesion promotor	1		
11	Talc	20		
	total	109,6		

#### Procedure:

Charge items 1 and 2, and mix to get homogenous system

Charge items 3 and 4, and mix to get homogenous system

Charge item 5 and mix to get homogenous system

Charge items 6, 7, 8, 9, 10 and 11, and mix to get homogenous system, then get part A

Blending ratio part A to part B: 12 to 1



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# The Sixth Element Materials Co., Ltd. at a glance

First tonnage graphene  
production line in China

42 patent families - 200 single  
patents, 74 patents granted

Leading graphene/graphene  
oxide manufacturer



Over 1000 t/a

Developed six series of graphene  
products



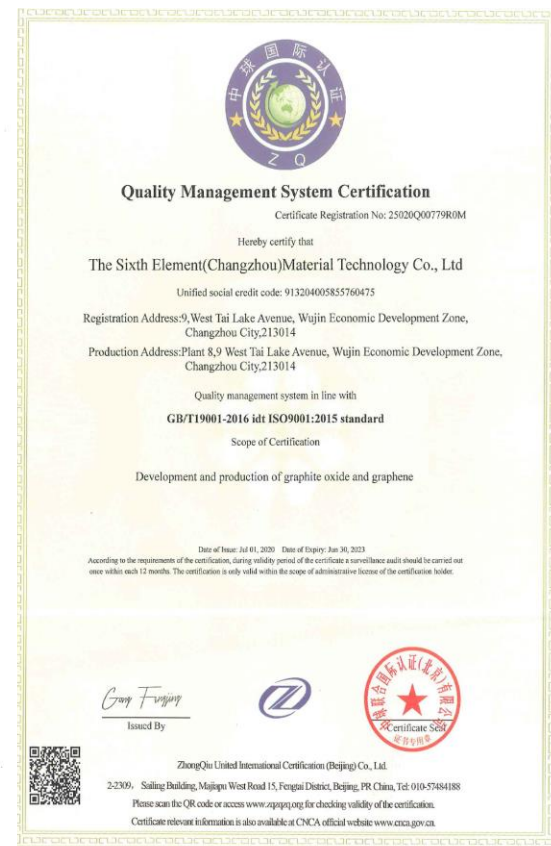
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# The Sixth Element at a glance

- ISO 9001 certified since 2014 - ISO 14001: 2015 certified since 2018 – IATF 16949 since 2019
- Substances EU REACH registered



The Sixth Element (Changzhou) Materials Technology Co., Ltd.





**T**he Sixth Element (Changzhou) Materials Technology Co., Ltd.  
常州第六元素材料科技股份有限公司

**Thank you !**

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