[0122]

[Table 1A]

	Substrate Film				Release Layer									
					Melamine-based Compound			Release Agent		Catalyst		Thickness of Release Layer (μm)	Surface Shape (nm)	
	Type	Thickness (μm)	Surface Roughness Sa (nm)		Type	Weight Average Polymerization Degree	Rate in Release Layer (parts by mass)	Type	Rate in Release Layer (parts by mass)	Type	Rate to Melamine Resin (parts by mass)		Roughness Sa	Height P
			Surface Layer A	Surface Layer B										
Example 1	X1	31	1	28	Full Ether-type	1.3	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	28
Example 2	X1	31	1	28	Full Ether-type	1.3	99.5	One-terminal Carboxyl Group-modified PDMS	0.5	p-Toluenesulfonic Acid	2	0.5	1	28
Example 3	X1	31	1	28	Full Ether-type	1.3	99	One-terminal Carboxyl Group-modified PDMS	1	p-Toluenesulfonic Acid	2	0.5	1	27
Example 4	X1	31	1	28	Full Ether-type	1.3	99.7	Both-terminals Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	25
Example 5	X1	31	1	28	Full Ether-type	1.3	99.9	Both-terminals Carboxyl Group-modified PDMS	0.1	p-Toluenesulfonic Acid	2	0.5	1	25
Example 6	X1	31	1	28	Full Ether-type	1.3	99.7	Side-chain Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	29
Example 7	X1	31	1	28	Full Ether-type	1.3	99.7	Carboxyl Group-containing Acrylic Silicone	0.3	p-Toluenesulfonic Acid	2	0.5	1	31
Reference Example 8	X1	31	1	28	Full Ether-type	1.5	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	27
Example 9	X1	31	1	28	Full Ether-type	1	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	P-toluenesulfonic Acid	2	0.5	1	27
Example 10	X1	31	1	28	Full Ether-type	1.1	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	p-toluenesulfonic Acid	2	0.5	1	27
Example 11	X1	31	1	28	Full Ether-type	1.3	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	P-toluenesulfonic Acid	2	0.2	1	28

PDMS: Polydimethylsiloxane

[0122]

[Table 1A]

	Substrate Film				Release Layer									
					Melamine-based Compound			Release Agent		Catalyst		Thickness of Release Layer (μm)	Surface Shape (nm)	
	Type	Thickness (μm)	Surface Roughness Sa (nm)		Type	Weight Average Polymerization Degree	Rate in Release Layer (parts by mass)	Type	Rate in Release Layer (parts by mass)	Type	Rate to Melamine Resin (parts by mass)		Roughness Sa	Height P
			Surface Layer A	Surface Layer B										
Example 1	X1	31	1	28	Full Ether-type	1.3	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	28
Example 2	X1	31	1	28	Full Ether-type	1.3	99.5	One-terminal Carboxyl Group-modified PDMS	0.5	p-Toluenesulfonic Acid	2	0.5	1	28
Example 3	X1	31	1	28	Full Ether-type	1.3	99	One-terminal Carboxyl Group-modified PDMS	1	p-Toluenesulfonic Acid	2	0.5	1	27
Example 4	X1	31	1	28	Full Ether-type	1.3	99.7	Both-terminals Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	25
Example 5	X1	31	1	28	Full Ether-type	1.3	99.9	Both-terminals Carboxyl Group-modified PDMS	0.1	p-Toluenesulfonic Acid	2	0.5	1	25
Example 6	X1	31	1	28	Full Ether-type	1.3	99.7	Side-chain Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	29
Example 7	X1	31	1	28	Full Ether-type	1.3	99.7	Carboxyl Group-containing Acrylic Silicone	0.3	p-Toluenesulfonic Acid	2	0.5	1	31
Example 8	X1	31	1	28	Full Ether-type	1.5	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	p-Toluenesulfonic Acid	2	0.5	1	27
Example 9	X1	31	1	28	Full Ether-type	1	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	P-toluenesulfonic Acid	2	0.5	1	27
Example 10	X1	31	1	28	Full Ether-type	1.1	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	P-toluenesulfonic Acid	2	0.5	1	27
Example 11	X1	31	1	28	Full Ether-type	1.3	99.7	One-terminal Carboxyl Group-modified PDMS	0.3	P-toluenesulfonic Acid	2	0.2	1	28

PDMS: Polydimethylsiloxane

[0124]

[Table 1C]

	Physical Properties								
	Charge		Slipperiness	Peel Force of Ceramic Sheet		Curl		Coatability	Pinhole
	Charge Amount (kV)	Evaluation	Coefficient of Static Friction (-)	(mN/mm)	Evaluation	Floating Amount (mm)	Evaluation		
Example 1	2.4	Very good	0.26	1.1	Very good	0.7	Very good	Good	Good
Example 2	1.1	Very good	0.19	0.8	Very good	0.7	Very good	Good	Good
Example 3	0.8	Very good	0.15	0.7	Very good	0.7	Very good	Good	Good
Example 4	2.3	Very good	0.16	0.9	Very good	0.7	Very good	Good	Good
Example 5	2.8	Very good	0.28	1.4	Very good	0.7	Very good	Good	Good
Example 6	0.5	Very good	0.17	0.9	Very good	0.7	Very good	Good	Good
Example 7	3.9	Good	0.18	1.9	Good	0.7	Very good	Good	Average
~~Example 8~~ Reference Example 8	3.2	Good	0.24	0.9	Very good	0.5	Very good	Good	Good
Example 9	3.3	Good	0.25	1	Very good	1.5	Good	Good	Good
Example 10	2.3	Very good	0.24	1	Very good	0.9	Very good	Good	Good
Example 11	1.2	Very good	0.29	1.6	Good	0.3	Very good	Good	Good
Example 12	4.5	Good	0.19	0.6	Very good	2.1	Good	Good	Good
Example 13	1.2	Very good	0.22	1.1	Very good	0.7	Very good	Good	Average
Example 14	3.2	Good	0.29	1.1	Very good	0.7	Very good	Good	Good
Comparative Example 1	9.2	Poor	0.19	1.6	Good	0.4	Very good	Good	Average
Comparative Example 2	5.1	Poor	0.31	- Unmeasurable Heavy Peeling	Poor	0.2	Very good	Good	Poor
Comparative Example 3	7.5	Poor	0.37	2.8	Poor	0.7	Very good	Good	Poor
Comparative Example 4	5.2	Poor	0.24	1.4	Very good	0.4	Very good	Good	Good
Comparative Example 5	5.3	Poor	0.22	2.6	Poor	0.2	Very good	Good	Poor

[0125]

The release films obtained in Comparative Examples all had a charge amount outside the range defined by the present invention. Therefore, extremely minute environmental foreign matters during the step tended to adhere to the release film.

INDUSTRIAL APPLICABILITY

[0126]

CLAIMS

1. A release film for manufacturing a ceramic green sheet, the release film comprising:

a polyester film substrate including a surface layer A forming one surface of the substrate and a surface layer B forming other surface; and

a release layer directly laminated on the surface layer A ~~directly or with other layer interposed between the release layer and the surface layer A~~,

wherein

a charge amount of the release layer is ± 5 kV or less when the release layer and the surface layer B are held for 48 hours under an atmosphere of 50°C and a pressure of 10 kPa in a state where the release layer and the surface layer B are brought into contact with each other, and then peeled off from each other,

an anti-static layer is not provided on surfaces of the surface layer A and the surface layer B, and the surface layer A and the surface layer B contain no anti-static agent,

the release layer is formed by curing a composition for forming the release layer,

the composition for forming the release layer contains polyorganosiloxane containing a carboxyl group as a release agent,

a content of a release agent is 0.05% by mass or more and 5% by mass or less in the release layer,

the composition for forming the release layer contains a melamine-based compound, and

a weight average polymerization degree of the melamine-based compound is more than 1.0 and 1.7 or less.

2. The release film for manufacturing a ceramic green sheet according to claim 1, wherein a coefficient of static friction μs when the release layer and the surface layer B are overlapped with each other is less than 0.30.

3. The release film for manufacturing a ceramic green sheet according to claim 1 or 2, wherein the ceramic green sheet has a thickness of 0.2 μm to 1.0 μm~~an anti-static layer is not provided on surfaces of the surface layer A and the surface layer B, and the surface layer A and the surface layer B contain no anti-static agent~~.

4. The release film for manufacturing a ceramic green sheet according to any one of claims 1 to 3, wherein

~~the release layer is formed by curing a composition containing at least a release agent and a melamine-based compound,~~

the composition for forming the release layer contains no anti-static agent, ~~and a weight average polymerization degree of the melamine-based compound is 1.7 or less,~~ and

a content of the melamine-based compound in the release layer is 80% by mass or more with respect to a solid content of the composition for forming the release layer.

5. The release film for manufacturing a ceramic green sheet according to any one of claims 1 to 4, wherein a weight average molecular weight of the melamine-based compound is of 400 or more and 1000 or less~~the release agent contained in the composition for forming the release layer is polyorganosiloxane containing a carboxyl group~~.

6. The release film for manufacturing a ceramic green sheet according to any one of claims 1 to 5, wherein the surface layer A contains substantially no inorganic particles.

7. The release film for manufacturing a ceramic green sheet according to any one of claims 1 to 6, wherein

the surface layer B contains particles,

at least a part of the particles are silica particles and/or calcium carbonate particles, and

a total content of the particles with respect to a mass of the surface layer B is 5000 to 15000 ppm.

8. The release film for manufacturing a ceramic green sheet according to any one of claims 1 to 7, wherein a thickness of the release layer is less than 1.0 μm.

~~8~~9. A method for manufacturing a ceramic green sheet, the method comprising using the release film for manufacturing a ceramic green sheet according to any one of claims 1 to ~~7~~8 and forming the ceramic green sheet, wherein the formed ceramic green sheet has a thickness of 0.2 μm to 1.0 μm.

~~9~~10. A method for manufacturing a ceramic capacitor, wherein the method for manufacturing a ceramic green sheet according to claim ~~8~~9 is employed.