



sofc & soec

Materials



Registered  
ISO 9001:2015  
ISO 14001:2015

**K** CERACELL

## Greetings

 **K CERACELL**, a SOFC/SOEC-specialized company, was founded based on a governmental grant encouraging the renewable energy sector in March 2010.

SOFC is one of the promising energy fields for solving environmental problems.

We have always focused on the R&D of high-power intermediate-temperature SOFC using core materials and natural/bio-gas directly.

We can guarantee that we will do our utmost for the development of future green energy as a SOFC/SOEC specialized company.

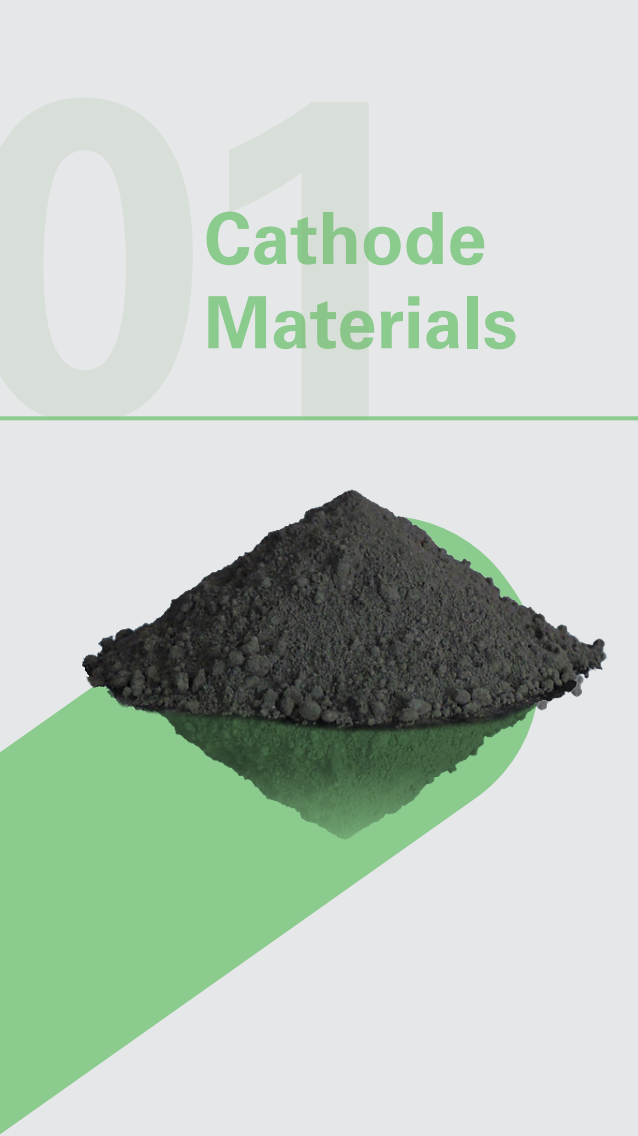
Lim Kyong tae, CEO



## Products



We stand developing new materials and ideal synthetic cells.  
Various self-developed materials are applied to SOFC cells and evaluated through continuous research and development for the commercialization of SOFC.



Lanthanum Strontium Manganite

| Name   | Composition                                           | SSA                     | PSD(d50)   |
|--------|-------------------------------------------------------|-------------------------|------------|
| LSM-HS | $(\text{La}_{0.7}\text{Sr}_{0.3})_{0.95}\text{MnO}_3$ | 10-15 m <sup>2</sup> /g | 0.2-0.4 μm |
| LSM-MS |                                                       | 5-10 m <sup>2</sup> /g  | 0.3-0.6 μm |
| LSM-LS |                                                       | 1-5 m <sup>2</sup> /g   | 0.6-1.0 μm |

Lanthanum Strontium Cobalt Ferrite

| Name    | Composition                                                                       | SSA                     | PSD(d50)   |
|---------|-----------------------------------------------------------------------------------|-------------------------|------------|
| LSCF-HS | $(\text{La}_{0.6}\text{Sr}_{0.4})_{0.97}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_3$ | 10-15 m <sup>2</sup> /g | 0.2-0.4 μm |
| LSCF-MS |                                                                                   | 5-10 m <sup>2</sup> /g  | 0.4-0.7 μm |
| LSCF-LS |                                                                                   | 1-5 m <sup>2</sup> /g   | 0.7-1.5 μm |

Lanthanum Strontium Cobaltite

| Name   | Composition                                  | SSA                     | PSD(d50)   |
|--------|----------------------------------------------|-------------------------|------------|
| LSC-HS | $\text{La}_{0.6}\text{Sr}_{0.4}\text{CoO}_3$ | 10-15 m <sup>2</sup> /g | 0.2-0.4 μm |
| LSC-MS |                                              | 5-10 m <sup>2</sup> /g  | 0.4-0.7 μm |
| LSC-LS |                                              | 1-5 m <sup>2</sup> /g   | 0.7-1.5 μm |

Lanthanum Strontium Ferrite

| Name | Composition                                  | SSA                   | PSD(d50)   |
|------|----------------------------------------------|-----------------------|------------|
| LSF  | $\text{La}_{0.6}\text{Sr}_{0.4}\text{FeO}_3$ | 4-8 m <sup>2</sup> /g | 0.4-0.7 μm |

Lanthanum Nickel Cobaltite

| Name | Composition                                  | SSA                   | PSD(d50)   |
|------|----------------------------------------------|-----------------------|------------|
| LNC  | $\text{LaNi}_{0.6}\text{Co}_{0.4}\text{O}_3$ | 4-8 m <sup>2</sup> /g | 0.4-0.7 μm |

Compositions and specifications modifiable on demand

Lanthanum Nickel Ferrite

| Name | Composition                                                 | SSA                   | PSD(d50)   |
|------|-------------------------------------------------------------|-----------------------|------------|
| LNF  | $\text{LaNi}_{0.6}\text{Fe}_{0.4}\text{O}_3$                | 4-8 m <sup>2</sup> /g | 0.3-0.7 μm |
| LNFC | $\text{LaNi}_{0.6}\text{Fe}_{0.3}\text{Cu}_{0.1}\text{O}_3$ | 4-8 m <sup>2</sup> /g | 0.3-0.7 μm |

Praseodymium Strontium Ferrite

| Name | Composition                                  | SSA                   | PSD(d50)   |
|------|----------------------------------------------|-----------------------|------------|
| PSF  | $\text{Pr}_{0.6}\text{Sr}_{0.4}\text{FeO}_3$ | 4-8 m <sup>2</sup> /g | 0.3-0.7 μm |

Praseodymium Strontium Cobaltite

| Name | Composition                                  | SSA                   | PSD(d50)   |
|------|----------------------------------------------|-----------------------|------------|
| PSC  | $\text{Pr}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$ | 4-8 m <sup>2</sup> /g | 0.3-0.7 μm |

Samarium Strontium Cobaltite

| Name | Composition                                  | SSA                   | PSD(d50)   |
|------|----------------------------------------------|-----------------------|------------|
| SSC  | $\text{Sm}_{0.5}\text{Sr}_{0.5}\text{CoO}_3$ | 4-8 m <sup>2</sup> /g | 0.3-0.7 μm |

Barium Strontium Cobalt Ferrite

| Name | Composition                                                              | SSA                   | PSD(d50)   |
|------|--------------------------------------------------------------------------|-----------------------|------------|
| BSCF | $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_3$ | 4-8 m <sup>2</sup> /g | 0.5-0.8 μm |

Compositions and specifications modifiable on demand

02

Electrolyte Materials



Stabilized Zirconia

| Name                          | Composition                                                                                                                                                                                   | SSA                     | PSD(d50)   |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|------------|
| 10Sc0.5Ce0.5GdSZ              | (Sc <sub>2</sub> O <sub>3</sub> ) <sub>0.1</sub> (CeO <sub>2</sub> ) <sub>0.005</sub> (Gd <sub>2</sub> O <sub>3</sub> ) <sub>0.005</sub> (ZrO <sub>2</sub> ) <sub>0.89</sub>                  | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| 9.5Sc0.5Gd0.5YbSZ             | (Sc <sub>2</sub> O <sub>3</sub> ) <sub>0.095</sub> (Gd <sub>2</sub> O <sub>3</sub> ) <sub>0.005</sub> (Yb <sub>2</sub> O <sub>3</sub> ) <sub>0.005</sub> (ZrO <sub>2</sub> ) <sub>0.895</sub> | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| 10Sc0.5Ca0.5YbSZ              | (Sc <sub>2</sub> O <sub>3</sub> ) <sub>0.1</sub> (CaO) <sub>0.005</sub> (Yb <sub>2</sub> O <sub>3</sub> ) <sub>0.005</sub> (ZrO <sub>2</sub> ) <sub>0.895</sub>                               | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| 6Yb4ScSZ                      | (Yb <sub>2</sub> O <sub>3</sub> ) <sub>0.06</sub> (Sc <sub>2</sub> O <sub>3</sub> ) <sub>0.04</sub> (ZrO <sub>2</sub> ) <sub>0.9</sub>                                                        | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| 8YSZ                          | (Y <sub>2</sub> O <sub>3</sub> ) <sub>0.08</sub> (ZrO <sub>2</sub> ) <sub>0.92</sub>                                                                                                          | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| New Electrolyte only for SOEC | Disclosed by Agreement                                                                                                                                                                        |                         |            |

Doped Ceria

| Name      | Composition                                           | SSA                     | PSD(d50)   |
|-----------|-------------------------------------------------------|-------------------------|------------|
| GDC-LTS   | Zn doped GDC                                          |                         |            |
| GDC-10-HS | Gd <sub>0.1</sub> Ce <sub>0.9</sub> O <sub>1.95</sub> | 10-15 m <sup>2</sup> /g | 0.1-0.2 μm |
| GDC-10-MS |                                                       | 5-10 m <sup>2</sup> /g  | 0.2-0.4 μm |
| GDC-10-LS |                                                       | 1-5 m <sup>2</sup> /g   | 0.4-0.8 μm |
| GDC-20-HS | Gd <sub>0.2</sub> Ce <sub>0.8</sub> O <sub>1.9</sub>  | 10-15 m <sup>2</sup> /g | 0.1-0.2 μm |
| GDC-20-MS |                                                       | 5-10 m <sup>2</sup> /g  | 0.2-0.4 μm |
| GDC-20-LS |                                                       | 1-5 m <sup>2</sup> /g   | 0.4-0.8 μm |
| SDC-20-HS | Sm <sub>0.2</sub> Ce <sub>0.8</sub> O <sub>1.9</sub>  | 10-15 m <sup>2</sup> /g | 0.1-0.2 μm |
| SDC-20-MS |                                                       | 5-10 m <sup>2</sup> /g  | 0.2-0.4 μm |
| SDC-20-LS |                                                       | 1-5 m <sup>2</sup> /g   | 0.4-0.8 μm |

Perovskite Electrolyte

| Name           | Composition                                                                                                  | SSA                   | PSD(d50)   |
|----------------|--------------------------------------------------------------------------------------------------------------|-----------------------|------------|
| LSGM-9182      | La <sub>0.9</sub> Sr <sub>0.1</sub> Ga <sub>0.8</sub> Mg <sub>0.2</sub> O <sub>2.85</sub>                    | 4-8 m <sup>2</sup> /g | 0.4-0.6 μm |
| LSGM-8282      | La <sub>0.8</sub> Sr <sub>0.2</sub> Ga <sub>0.8</sub> Mg <sub>0.2</sub> O <sub>2.8</sub>                     | 4-8 m <sup>2</sup> /g | 0.4-0.6 μm |
| LSGMZ          | La <sub>0.8</sub> Sr <sub>0.2</sub> Ga <sub>0.8</sub> Mg <sub>0.18</sub> Zn <sub>0.02</sub> O <sub>2.8</sub> | 4-8 m <sup>2</sup> /g | 0.4-0.6 μm |
| BZCYY          | BaZr <sub>0.8-X</sub> Ce <sub>X</sub> Y <sub>0.1</sub> Yb <sub>0.1</sub> O <sub>3</sub>                      | 4-8 m <sup>2</sup> /g | 0.6-1.0 μm |
| BZ doped BCZYY | Disclosed by Agreement                                                                                       |                       |            |

Compositions and specifications modifiable on demand

Nickel Oxide

| Name   | Composition | SSA                     | PSD(d50)   |
|--------|-------------|-------------------------|------------|
| NiO-HS | NiO         | 10-15 m <sup>2</sup> /g | 0.1-0.3 μm |
| NiO-MS |             | 5-10 m <sup>2</sup> /g  | 0.3-0.6 μm |
| NiO-LS |             | 1-5 m <sup>2</sup> /g   | 0.6-1.2 μm |

Stabilized Zirconia

| Name    | Composition                                                                          | SSA                    | PSD(d50)   |
|---------|--------------------------------------------------------------------------------------|------------------------|------------|
| 8YSZ-AS | (Y <sub>2</sub> O <sub>3</sub> ) <sub>0.08</sub> (ZrO <sub>2</sub> ) <sub>0.92</sub> | 5-10 m <sup>2</sup> /g | 0.3-0.8 μm |

Lanthanum Strontium Titanate

| Name | Composition                                        | SSA                   | PSD(d50)   |
|------|----------------------------------------------------|-----------------------|------------|
| LST  | La <sub>1-X</sub> Sr <sub>X</sub> TiO <sub>3</sub> | 4-8 m <sup>2</sup> /g | 0.4-0.8 μm |

Spinel

| Name      | Composition                                                           | SSA                   | PSD(d50)   |
|-----------|-----------------------------------------------------------------------|-----------------------|------------|
| MC-11-APS | Mn <sub>1.5</sub> Co <sub>1.5</sub> O <sub>4</sub>                    |                       | 30-40 μm   |
| MCF-APS   | MnCo <sub>1.9</sub> Fe <sub>0.1</sub> O <sub>4</sub>                  |                       | 30-40 μm   |
| CMF       | Cu <sub>1.2</sub> Mn <sub>1.65</sub> Fe <sub>0.1</sub> O <sub>4</sub> | 4-8 m <sup>2</sup> /g | 0.5-0.8 μm |

Compositions and specifications adjustable on demand

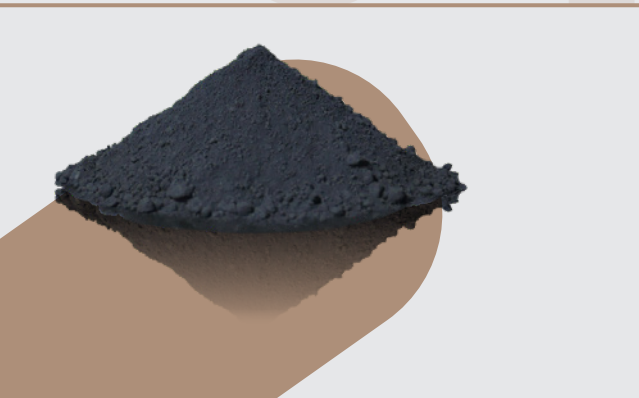
03

Anode Materials



04

Spinel Materials





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