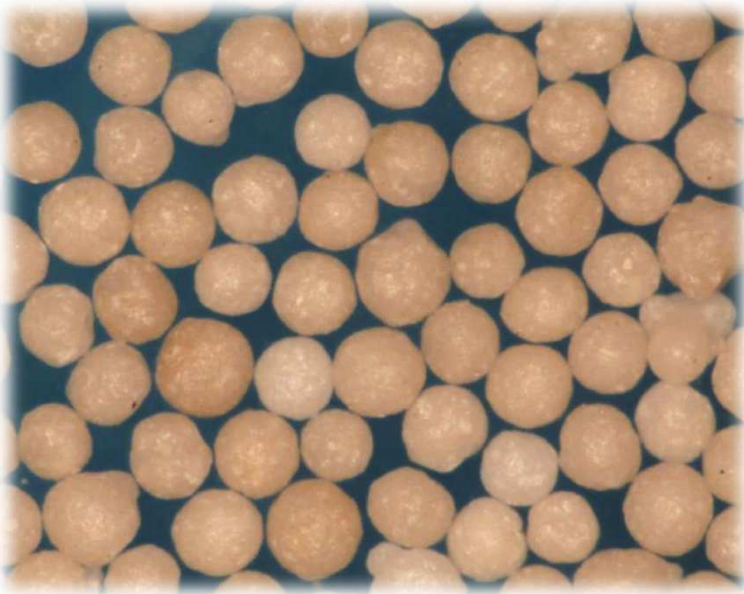


CERABEADS[®]-ES

Enhanced Strength

Enhanced Strength CERABEADS[®] to meet your needs for production



- Made of dense mullite crystal
- Resistant to abrasion crush and thermal shock
- For high heat resistance and low thermal expansion
- Spherical for good compaction, fluidity and enhanced strength
- The same chemical composition as before

**Improve your strength
Lower your binder level**



ITOCHU CERATECH CORPORATION

CERABEADS®-ES Chemical Composition % (measured by Fluorescent X-Ray Analyzer)

| Al ₂ O ₃ | SiO ₂ | Fe ₂ O ₃ | TiO ₂ | CaO | MgO | K ₂ O | Na ₂ O | P ₂ O ₅ |
|--------------------------------|------------------|--------------------------------|------------------|------|------|------------------|-------------------|-------------------------------|
| 60.83 | 35.70 | 1.09 | 0.86 | 0.29 | 0.13 | 0.19 | 0.39 | 0.31 |

Using carefully selected raw materials, contents are adjusted, so the chemical composition is stable from lot to lot.

Physical Property Comparison chart with other Sands

| | Refractori- ness °C | Heat Resist.※1 Passing rate% | Bulk Density※2 g/cm ³ | Permeability※3 | Thermal Expansion% (at 300 sec.) | Fracture rate% (according to JACT S-6standard) |
|----------------------|------------------------|---------------------------------|-------------------------------------|----------------|--|--|
| CERABEADS®-ES | 1,825 | 100 | 1.75 | 230 | -0.06 | 105 |
| NAIGAI CERABEADS® | 1,825 | 100 | 1.70 | 251 | -0.08 | 106 |
| SILICA | 1,730 | 100 | 1.58 | 259 | 1.56 | 126 |

※1 Sieve passing rate after heating the sand to 1500°C and vibrating for 1mins through 3.35mm sieve.

※2. Bulk density measured after vibrating the sand for 3mins. ※3. Sand measured after being passed through 50/70 mesh sieve.

CAN WITHSTAND TEMPERATURES UP TO 1,825°C(SK37)PROVING ITS HIGH HEAT RESISTANT PROPERTY

HAS BETTER COMPACTION THAN NAIGAI CERABEADS®, WHILE IMPROVEMENT IN STRENGTH IS SHOWN FOR COLD BOX AND NO BAKE PROCESSES

DENSE MULLITE CRYSTAL

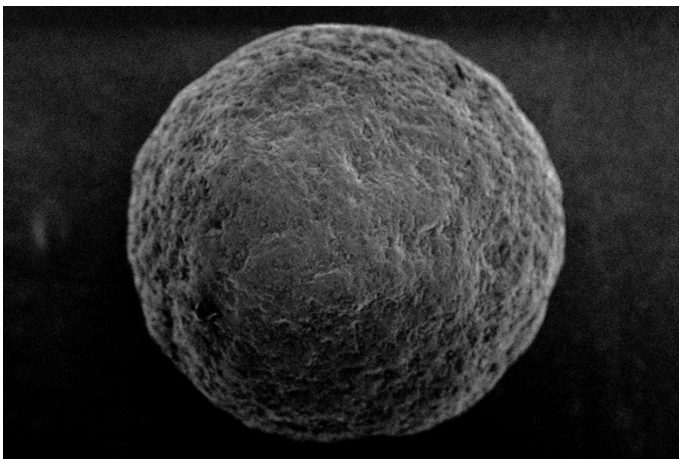


Figure 1. SEM photo

SIEVE ANALYSIS

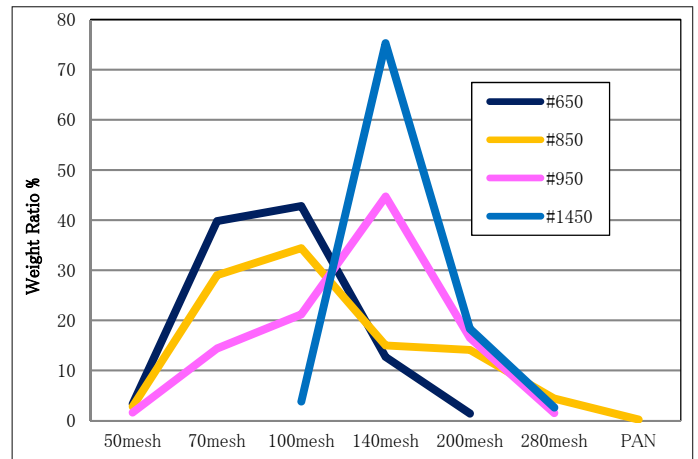


Figure 2. Sieve Analysis

PHENOLIC ESTER NB STRENGTH COMPARISON※

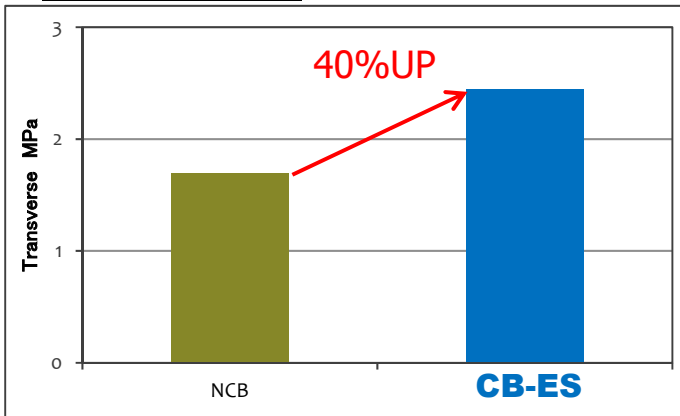


Figure 3. Phenolic Ester NB transverse strength comparison
Test Conditions: Resin 1.5 wt%. 25°C-55%RH(using humidity chamber)

※Strength test results will vary depending on test conditions

COLD BOX STRENGTH※

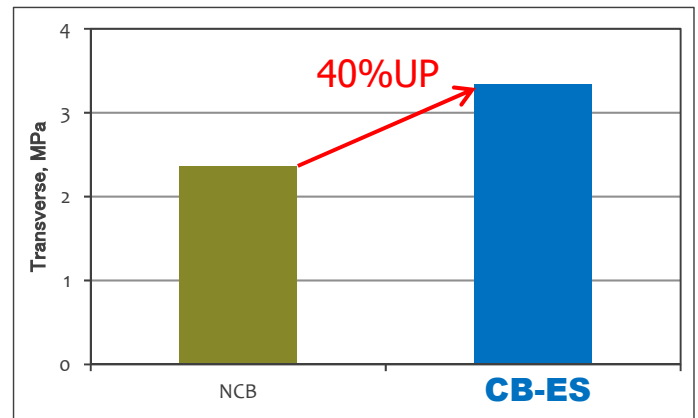


Figure 4. Cold Box transverse strength comparison
Test conditions: Part I 0.6 wt%, Part II 0.6 wt% 25°C-55%RH(using humidity chamber)