

## Technical Alumina Grades – Typical Properties

| Composition                    |                      | IPSAL92<br>(wear resistant only) | IPSAL95           | IPSAL96           | IPSAL99           | IPSAL995          | IPSAL997          |
|--------------------------------|----------------------|----------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Al <sub>2</sub> O <sub>3</sub> | %                    | 92                               | 95                | 96                | 99                | 99.5              | 99.7              |
| CaO                            | %                    | 2                                | 1.8               | 1.8               | 0.2               | ≤0.05             | ≤0.05             |
| SiO <sub>2</sub>               | %                    | 5                                | 2.5               | 2.5               | 0.3               | 0.2               | 0.1               |
| MgO                            | %                    | 1                                | 0.5               | 0.5               | 0.2               | ≤0.05             | ≤0.05             |
| Fe <sub>2</sub> O <sub>3</sub> | %                    | 0.1                              | 0.05              | 0.04              | 0.03              | ≤0.03             | ≤0.02             |
| Other Oxides                   | %                    | ≤0.10                            | ≤0.05             | ≤0.05             | ≤0.03             | ≤0.02             | ≤0.02             |
| Property                       |                      |                                  |                   |                   |                   |                   |                   |
| Max Service Temperature        | °C (°F)              | 1400 (2550)                      | 1450 (2650)       | 1500 (2700)       | 1600 (2900)       | 1650 (3000)       | 1650 (3000)       |
| Bulk Density                   | g/cm <sup>3</sup>    | 3.6                              | 3.7               | 3.7               | 3.8               | 3.9               | 3.9               |
| Open Porosity                  | %                    | <0.5                             | <0.5              | <0.5              | <0.25             | <0.25             | <0.25             |
| Modulus of Rupture (room Temp) | MPa                  | 200                              | 250               | 250               | 300               | 350               | 400               |
| Modulus of Elasticity          | GPa                  | 300                              | 350               | 350               | 400               | 400               | 400               |
| Thermal Conductivity           | W/mK                 | 20                               | 25                | 25                | 30                | 35                | 35                |
| Thermal Expansion (20-1000°C)  | x10 <sup>-6</sup> /K | 7                                | 8                 | 8                 | 8                 | 8                 | 8                 |
| Hardness (Vickers)             | GPa                  | 11                               | 14                | 14                | 15                | 15                | 16                |
| KIC Fracture Toughness         | MPam <sup>1/2</sup>  | 2.5                              | 2.5               | 2.5               | 3.0               | 4.0               | 4.0               |
| Volume Resistance              | Ωcm                  | <10 <sup>14</sup>                | <10 <sup>14</sup> | <10 <sup>14</sup> | <10 <sup>14</sup> | <10 <sup>14</sup> | <10 <sup>14</sup> |
| Dielectric Constant            | -                    | 8                                | 9                 | 9                 | 10                | 11                | 12                |
| Dielectric Strength            | kV/mm                | 10                               | 20                | 20                | 30                | 30                | 30                |

This information is given in good faith but does not constitute a specification or guarantee.