

REQUEST FOR CAPABILITIES SILICON NITRIDE-BASED CERAMICS

Technology Reserve is seeking know-how deposits and Technology Packages in the field of silicon nitride-based ceramics

Silicon-based ceramics, such as silicon nitride, are used to produce cutting tools, industrial bearings, and even automobile components like turbochargers, exhaust valves, and piston inserts. Since ceramics are 60% lighter than most metal components, there is incentive to use them in bigger, more complex structures where they could improve vehicle efficiency and reduce CO₂ emissions. In addition to their light weight, their most desirable properties are their high-thermal shock resistance, hardness, strength, and fracture resistance.

The sialon ceramics, a specialized group of silicon ceramics more easily processed than silicon nitride, are based on the elements silicon, aluminum, oxygen, and nitrogen (i.e. SiAlON). These ceramics are widely used in applications requiring a refractory and corrosion resistant material, such as pipes conveying molten aluminum or corrosive liquids. The sialons have excellent wear resistance, similar to silicon nitride ceramics, making them a preferred material in applications that require handling of abrasive materials at very high speeds.

The addition of additives or binders (e.g., yttrium oxide or cerium oxide) can significantly lower the temperatures required for sintering, and assist in the formation and densification of the ceramics. Optimal formulation will increase the manufacturing window for production of larger sizes of silicon nitride and sialon parts, and thus represents an enabling capability for entering high-value markets.

Technology Reserve's client seeks experts in ceramic processing and raw material formulation, to develop processes and formulations for larger or more complex ceramic components.

Key Capabilities:

- Experience in developing formulations and processes for silicon-based ceramics, including silicon nitride and sialon
- Experience with industrial quality control systems
- Knowledge of potential new market opportunities for silicon-based ceramics is a plus

An ideal expert partner will:

- Deposit and transfer know-how for silicon nitride or sialon ceramics formulations and processing
- Assist the client in identifying new markets for silicon nitride and sialon materials

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