

Advanced Processing for Powder Metallurgy (P/M) - High Performance and Cost Effective Materials

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Motivation:

Powder Metallurgy (PM) provides an alternative forming technique catering to the demands for improved material performance and economy of process.

Objective & scope of project:

The main objective of this project is to develop processing techniques and material compositions for high-end and high value-add applications with cost-effective processing techniques, focusing on transparent ceramics and texture ceramics. The second objective of this project is to setup an advanced Powder Metallurgy Laboratory (PML) supporting industries in this region.

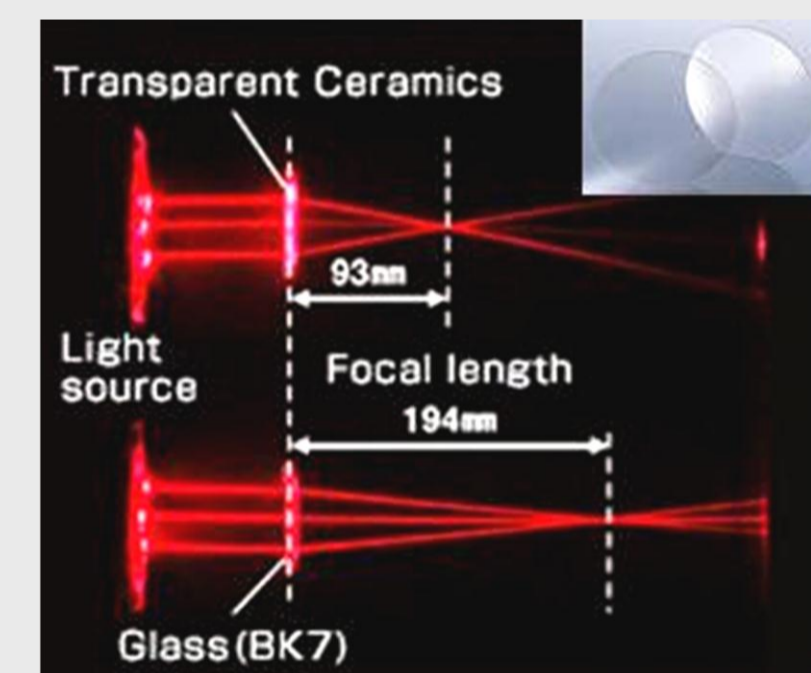
The main scope includes powder production with fine grain size or certain shapes, investigation and simulation of powder injection moulding process and investigation on sintering and drying combined process to get near theoretical density for transparent ceramics and texture structure for textured ceramics.

Industrial significance:

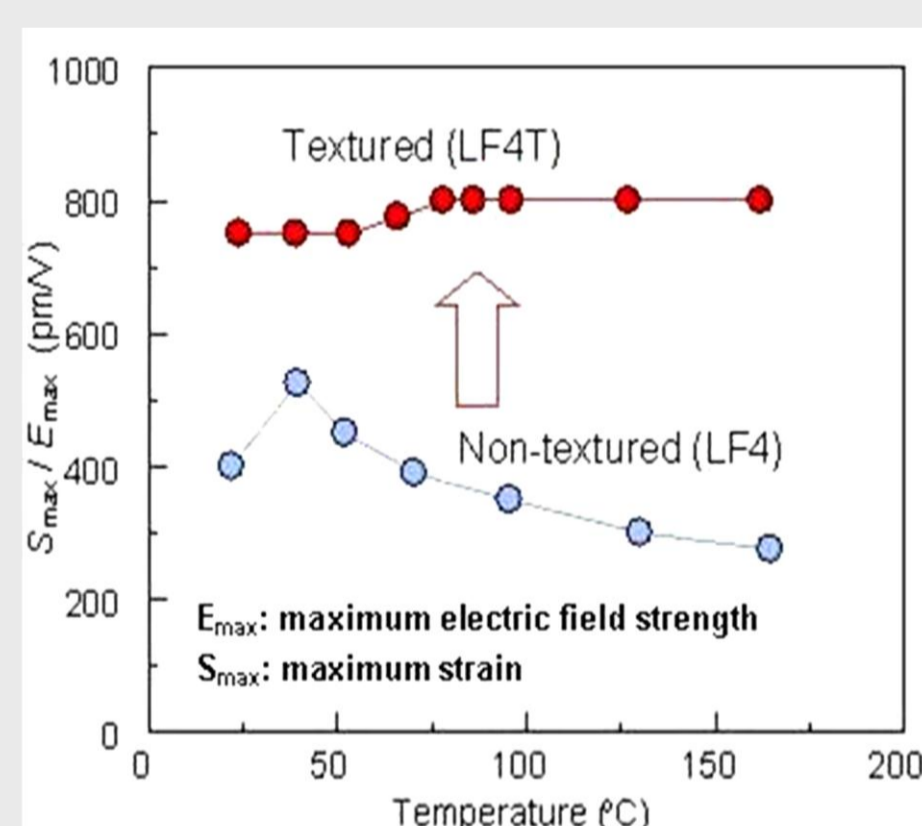
The advanced ceramic materials have wide applications in a variety of areas due to their excellent mechanical, thermal, optical, electrical and chemical properties.

■ Transparent Ceramics

The miniaturization of optical devices, such as pick-up lens, laser sensors, requires new materials with a high refractive index, normally greater than 1.9. The transparent ceramic materials, which overcome the limitations of traditional optical glass or plastics, can be explored to be used potentially in such applications via near net shape powder processing routes.



Casio's ceramic lens and comparison of refractive index



Performances of the textured and non-textured (LF4) ceramics

■ Textured Ceramics

The traditional processing goal for ceramics is to achieve dense, fine equiaxed grains with random crystallographical orientations. Recently, the textured ceramics, in which the orientation distribution of crystallites is controlled, were found dramatic enhancement in mechanical and physical properties. Several techniques have been developed to produce such texture structure. Powder injection moulding has the potential to be one process for manufacturing textured ceramics.

Target Industries:

This project mainly aims at developing processing techniques and material compositions for local powder and PM/PIM industries.