In the Year 2006, C-MET has set-up a prototype-level fabrication set-up for Low Temperature Co-fired Ceramic (LTCC) circuits and packages. LTCC is an important multilayer circuit fabrication technology that allows multilayer microwave circuits with integrated passive components, creates high density circuits, multi-chip modules *etc*. Apart from high frequency circuits, this technology is also applied for highly exciting integrated System on Package (SOP) applications in biomedical diagnostics, avionics, terrestrial and satellite communications, mobile applications etc. The C-MT facility was subsequently upgraded to acquire advanced processing capabilities.

DST, through its Technology Systems Development (TSD) programme and C-MET have now jointly funded a programme for the development of indigenous LTCC materials for general purpose applications. The aim of this programme is to create-end-to-end solution for LTCC within the country. Under this programme, the laboratory scale development of LTCC tapes completed by C-MET is proposed to be fine tuned and scaled-up to pilot scale. This development will go hand-in-hand to pilot scale development of Silver and Silver-Palladium based Screen-printing and via-filling pastes which would be fully compatible to the tape materials.

Objectives of the project is to develop indigenous, mutually compatible LTCC materials system at
pilot scale, comprising of:

1. LTCC Tapes (>6.625")

- Dielectric Constant <10
- Dielectric Loss< 0.15%

2. Compatible Ag and Ag-Pd pastes for screen printing and via filling

- Ag paste: Sheet resistance < 8mW/o
- Ag-Pd Paste: Sheet resistance < 50mW/o
- Print resolution: 150µm

At C-MET, Thrissur, crystallizable anorthite glass in the system Ca-Al-B-Si has been identified with a Tg & Ts 670 ˚C and 730 ˚C. The LTCC composition developed was found to sinter to full density at 850 ˚C. Batches of 7 x 7 inch LTCC tapes, which are visibly defect free, have been made for evaluation. At C-MET, Pune, the tapes of sizes 2 × 2 inch to 7 x 7 inch dimension have been tested using the state of the art LTCC facility. It is found that the roughness of these tapes is low 1.14 µm (SD: 0.07 µm) While thickness is found to be ~117µm. Various parameters involved in LTCC fabrications steps *viz.* punching, printing, stacking, lamination and firing were set up for the C-MET TCR tapes.

C-MET, Pune has been taking efforts to develop the Ag based paste system for the LTCC tapes prepared at C-MET, Thrissur. The aim is to develop these pastes at pilot scale and related process equipment has been procured. Various paste quality parameters, such as, printability, resistivity, organic and inorganic compatibility with the tapes, shrinkage matching with the tapes, etc are being dealt with during the development. Various experiments related to compatibility of silver paste with the in-house LTCC tapes are being worked out.

Glass

Glass rod

Glass

Precipitation unit