

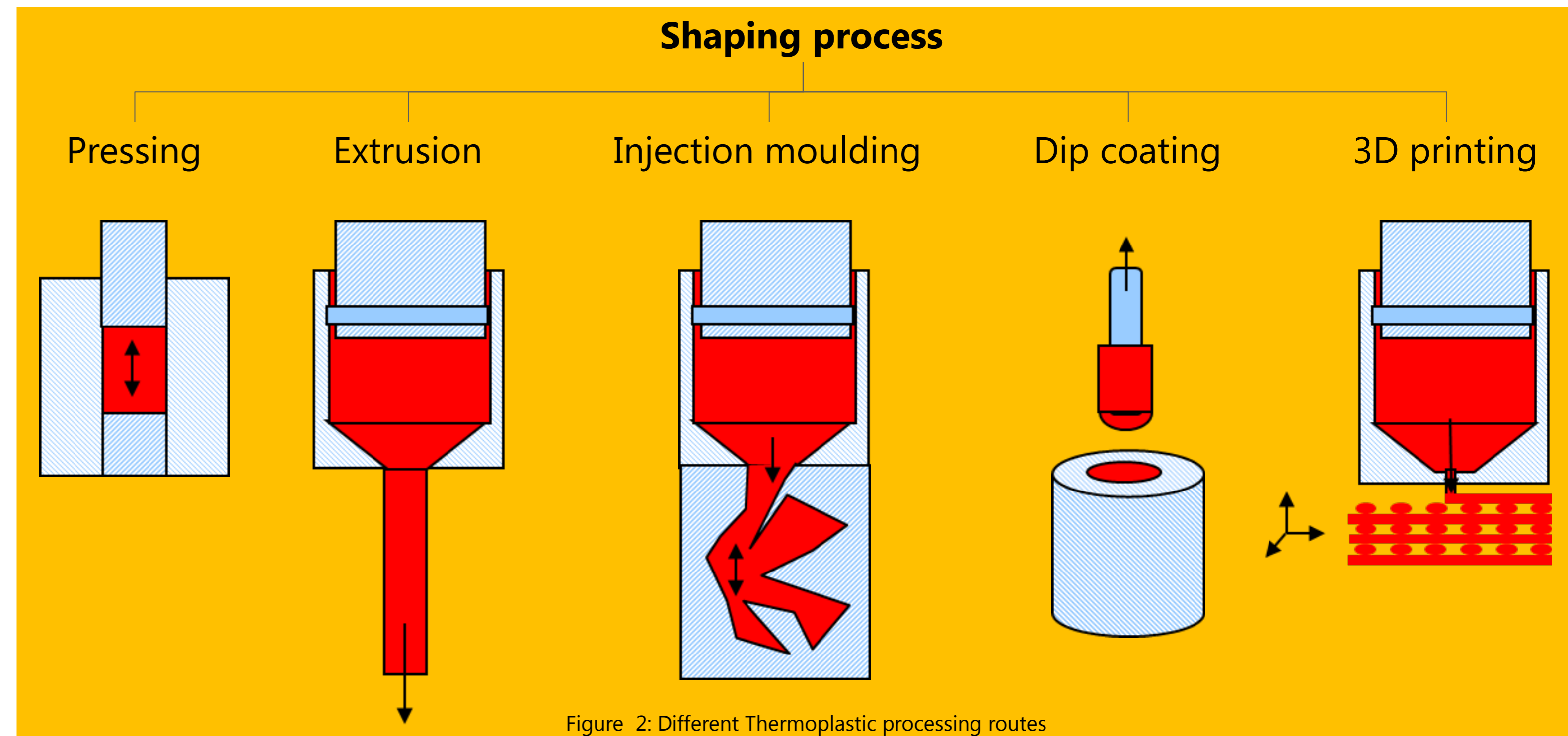
Smart Processing for Ceramics and Sensor-Composite Materials

At Empa, the Smart Ceramic Processing group focuses on the fabrication of ceramic and sensor structures using a thermoplastic processing route. Pressing, dip coating, extrusion, injection moulding and 3D printing are thermoplastic manufacturing techniques where high inorganic powder content > 56 vol.-% can be used. The group uses all of these techniques for the shaping of ceramics, metals and composites, as well as functional materials in research and development projects with academic and industrial partners.

When ceramic, metal or composite components are fabricated, the thermoplastic material is typically decomposed by thermal processes. Using these techniques, functional ceramic materials like mixed ionic electronic conductors (MIECs) for membrane or SOFC applications, piezoelectric materials for energy harvesting, transducer or transformer applications or simple mechanic structures based on oxide or none oxides, can be built up. Near net shaping, low friction, low metal contamination and high reproducibility are the main advantages using this technique. The debinding process is one of the main drawbacks and scientifically investigated by the team using kinetic modelling tools for optimization.

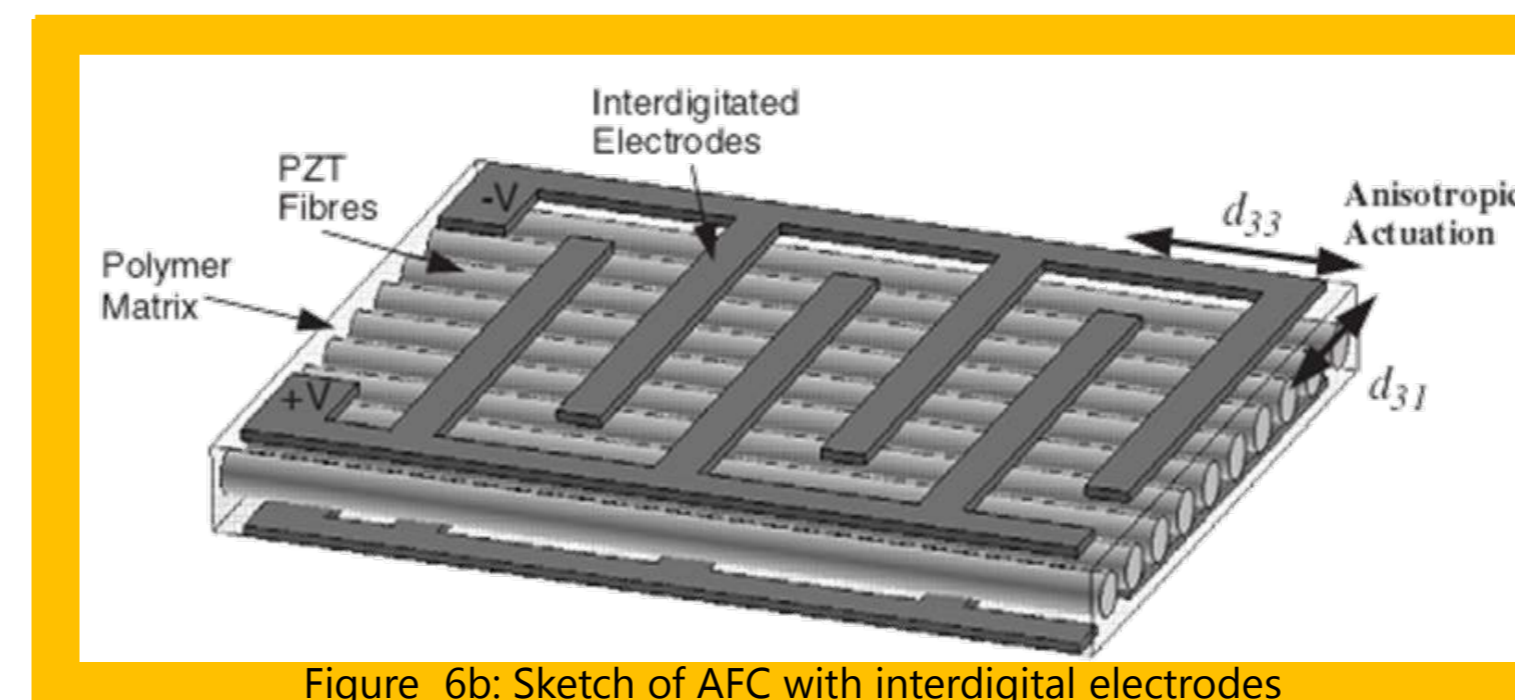
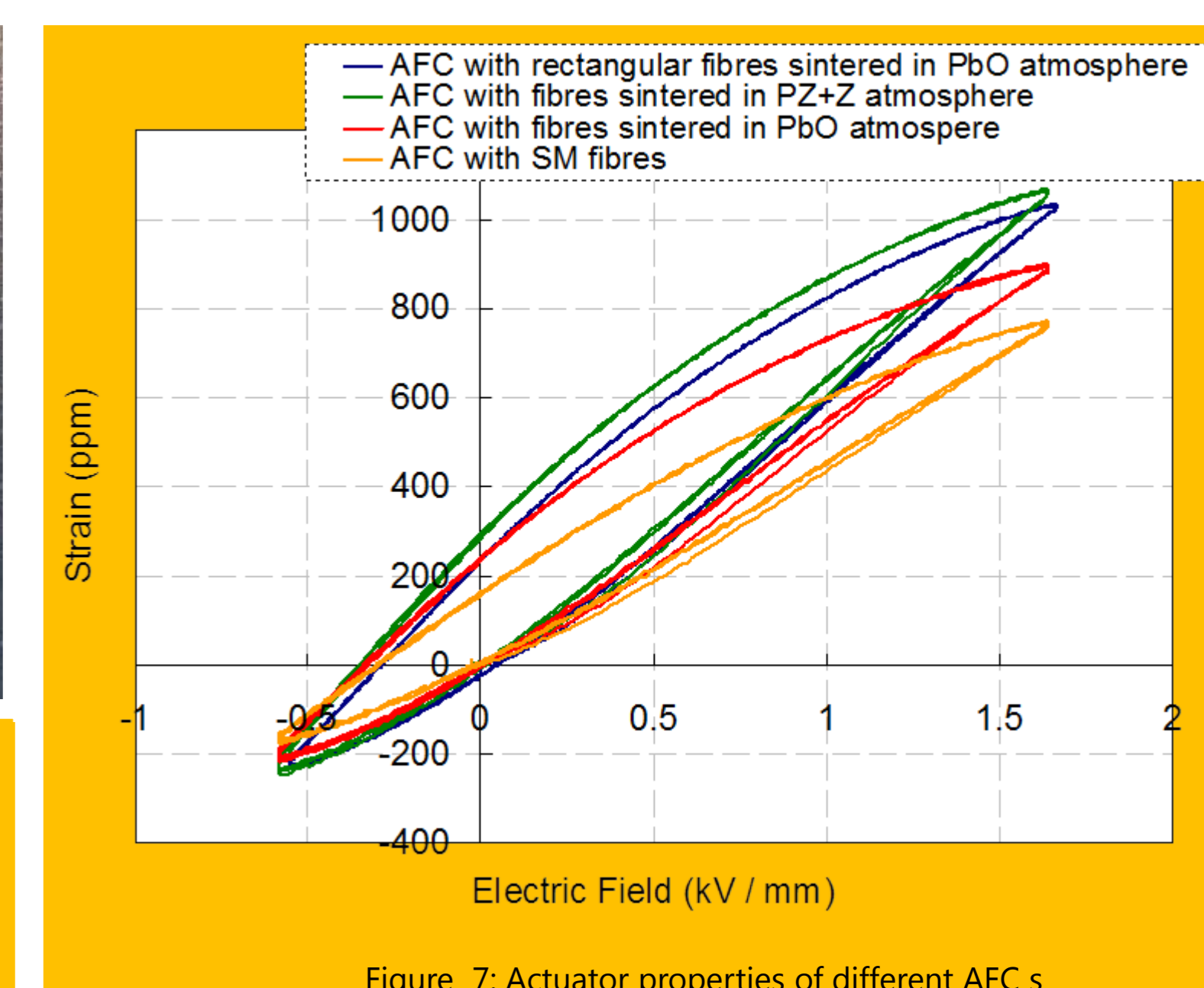
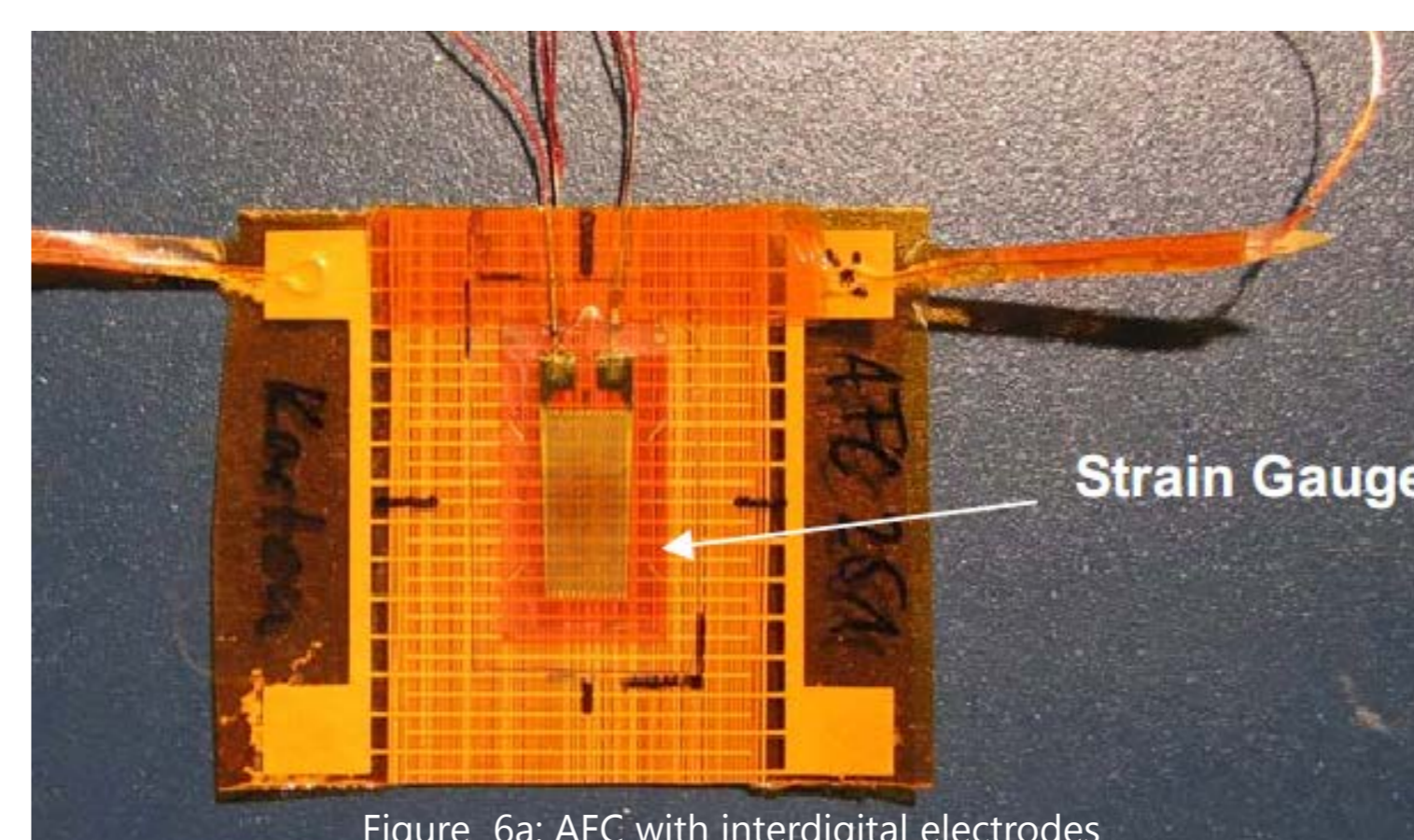
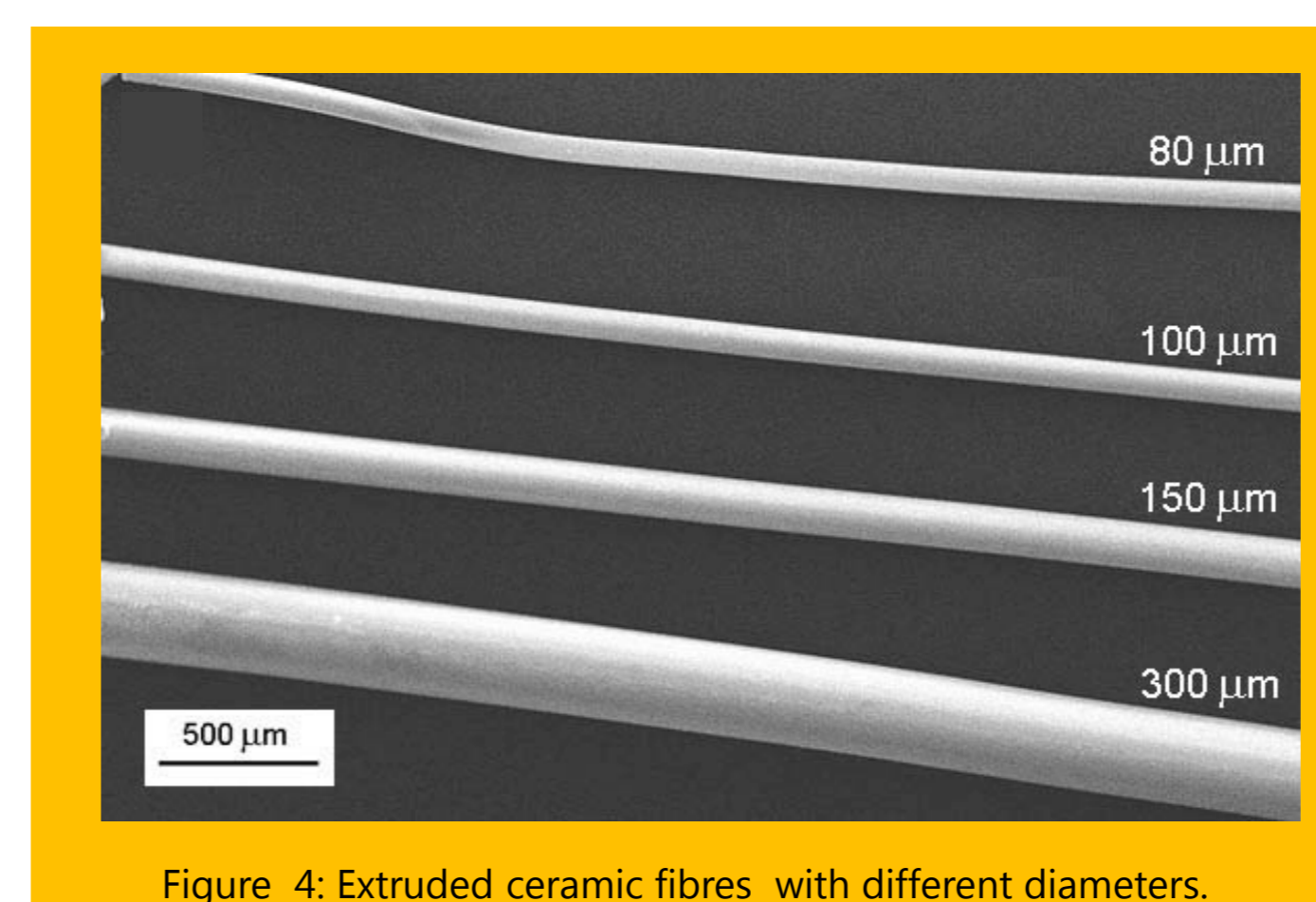
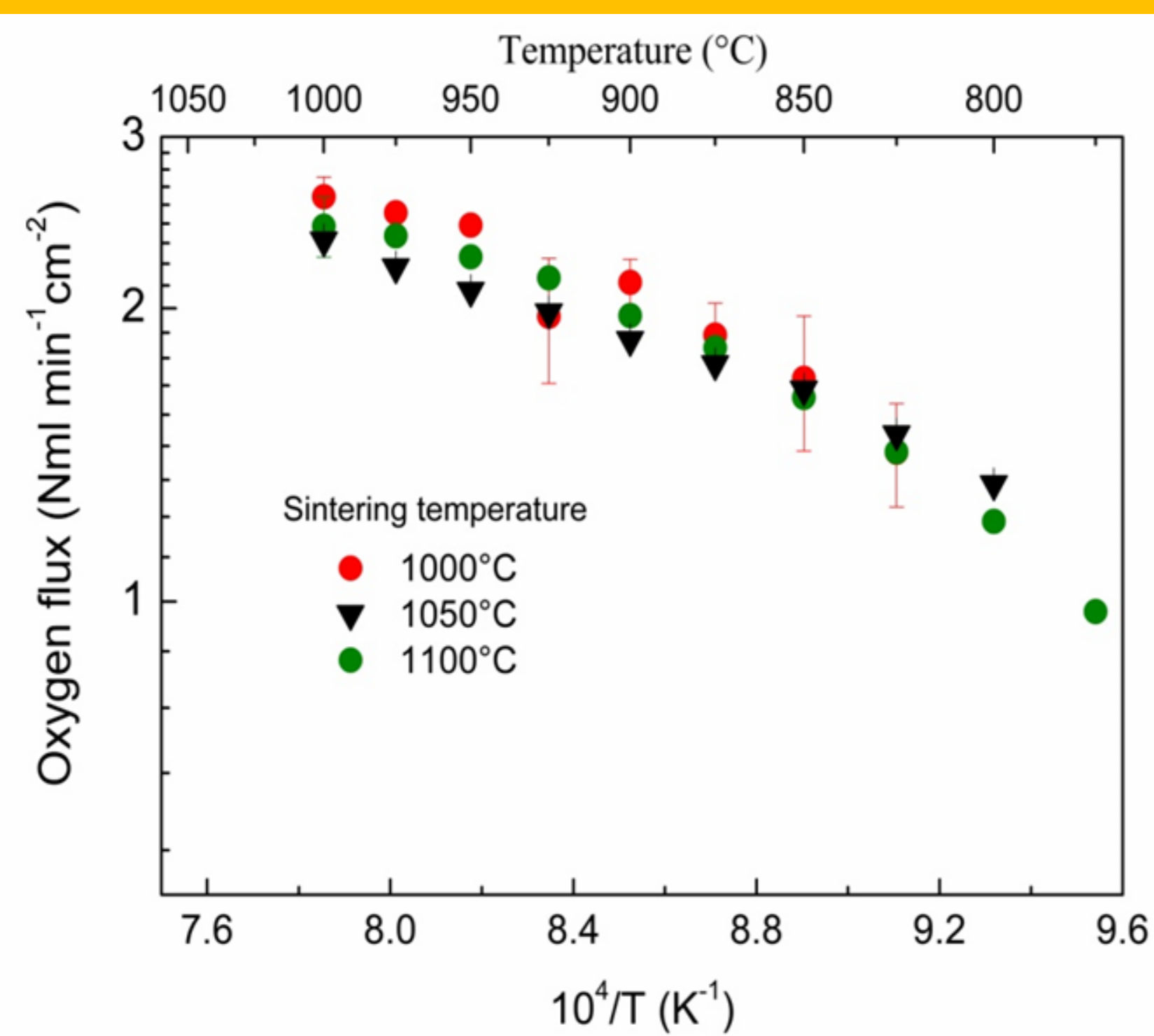
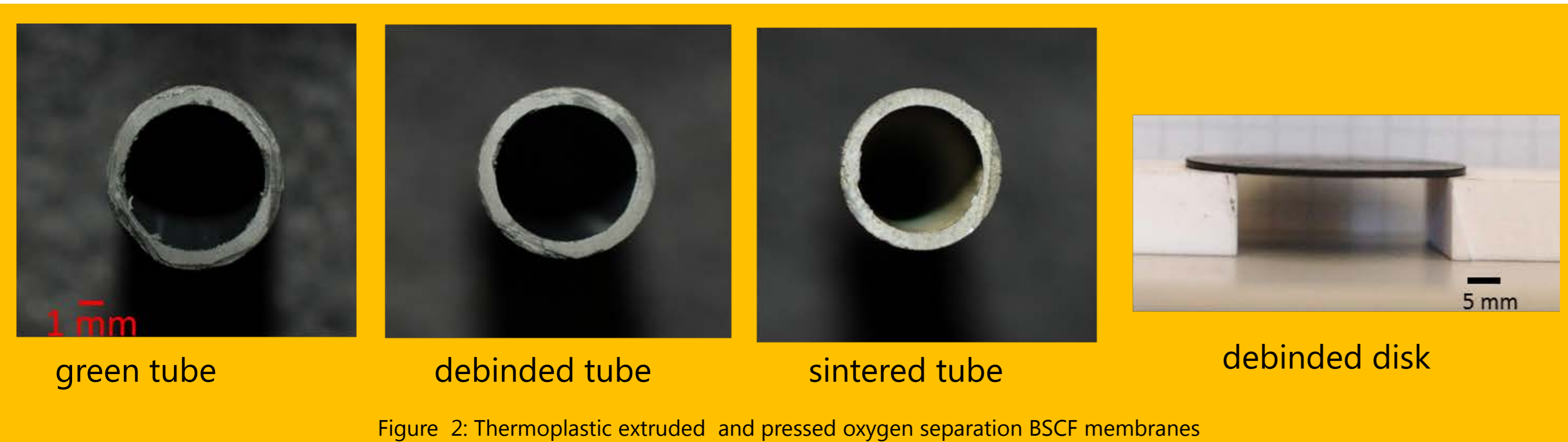
Due to the strong knowhow of inorganic materials, in the case of sensor materials, the team focuses on inorganic polymers and thermoplastic elastomers. These soft condensed materials have unique properties using a high inorganic filler content.

With fibrous inorganic ceramic materials a low percolation threshold can be achieved. This helps to achieve better properties in comparison to inorganic powder. Therefore, different inorganic fibre processing routes, namely melt and electrospinning process are used.



Active Fibre Composites (AFCs)

Extrusion of Thin Ceramic Membranes



NUI (Natural User Interface)

<https://www.youtube.com/watch?v=nOx6sEsHFiQ>

3D Printed Ceramic Scaffolds

