The Future Circular Collider Study (FCC, hosted by CERN) explores possible designs for circular colliders addressing the post-LHC era. To reach higher energies, which is fundamental for studying up-to-now unexplained phenomena, the development of new technologies, i.e. new coil concepts, providing magnetic fields up to 16 T, is needed.

An important aspect of this study is the search for improved resin impregnation systems, with the objective to reduce or even eliminate field-limiting effects that occur during magnet training, such as micro-cracking, plastic deformation, or delamination. A current cooperation between ETH Zürich, Paul Scherrer Institute and CERN, embedded in the CHART (Swiss Accelerator Research and Technology) initiative, therefore, aims at the development of such tough epoxy systems suited for the impregnation of future high-field superconducting magnets.

In the first project period, a baseline is established by the characterization of four technically relevant systems that are compared with regard to their mechanical and processing properties at room temperature and liquid-nitrogen temperatures.

The first part of this lecture presents the methods and results of the material characterization. This is followed by a second part that shows how material parameters like fracture toughness, glass transition and thermal expansion interact in a simple screening test, such as the resin-bolt thermal shock test. Finally, the ultimate goal of predicting the thermo-mechanical performance of the resins based on material parameters, for example, by using finite element simulations will be briefly discussed.