Carbon dioxide is one of the main causes of temperature increase, thus avoiding its release in the atmosphere through capture and/or utilization strategies is a valuable tool to limit greenhouse effect. The present technology for sequestering CO₂ from flue gasses relies on its reaction with amines in aqueous solutions however, due to the energy intensive release step, toxicity and corrosiveness; amine scrubbing could not represent a long-term solution in CO₂ capture.

IIT is working on several methods to capture carbon dioxide, e.g. Ionic liquids (ILs), organic salts in the liquid state near room temperature, are a class of emerging materials with a great potential towards CO₂ capture. Solution of task specific dendrimers, branched polymers with high number of functional groups that has a low ratio surface/volume decreasing problems linked to viscosities. Membrane based on graphene and functionalized graphene oxide are promising to separate CO₂ from other gases.

Finally mCO₂ capture involves also possible use of CO₂ directly as building block for sequestration of CO₂ without chemical reduction e.g. production of organic carbonate/polycarbonate/polyurea.
### Objectives

The main research objectives of this PhD thesis includes (not necessarily all):

**Development of new ionic liquids /Dendrimers for CO₂ sequestration** – synthesis and investigation of new ionic liquid possibly BIO derived or at list biocompatible. Synthesis and investigation of task specific dendrimers

**New materials for membranes and membranes formulation** - study and development of innovative carbon-based materials (graphene/graphene oxide) intercalated with ionic liquids or polymers to separate CO₂.

**CO₂ as building block** – use of CO₂ as building block for the production of functional molecules or polymers for a durable sequestration.

**Integration** with the other lines of the center – Support the lines of the CSFT center by close collaboration e.g. supply ionic liquids and other materials to be used as catalyst/media for CO₂ reduction or for the production of supercapacitors.

### Skills and competencies for the development of the activity

Candidates should have a solid chemistry background (preferably organic/polymeric materials), basic knowledge of material science and motivation to learn through advanced research.

Expertise in nanomaterials, electrochemistry, advanced processes and technologies is preferred.

Problem solving ability and practical experience for laboratory activity is also required.