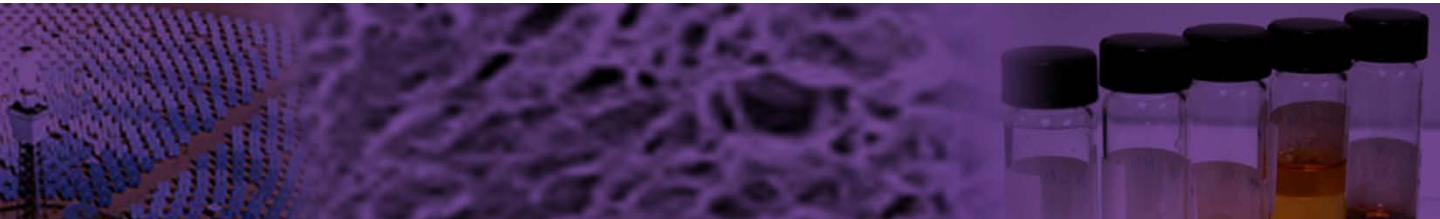
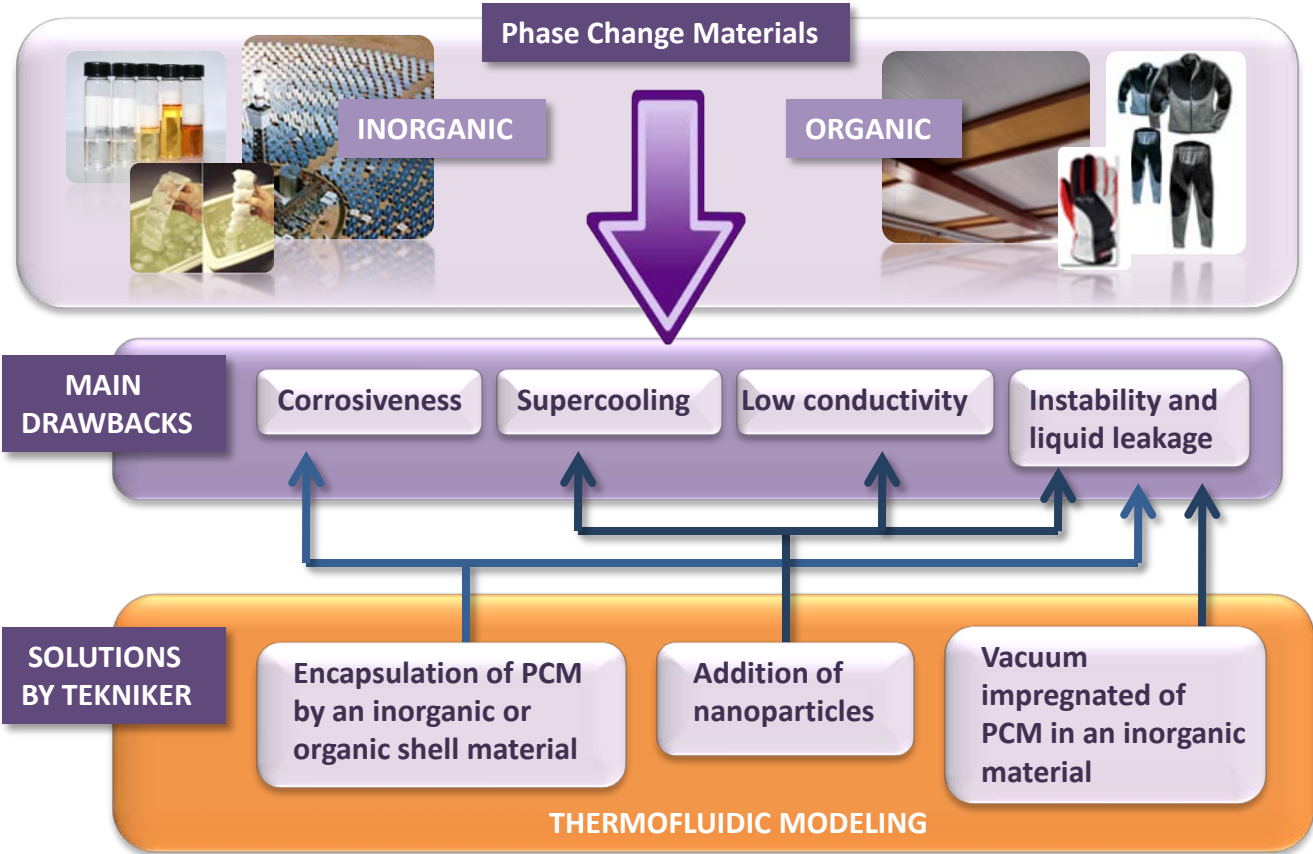


THERMAL ENERGY STORAGE based on Phase Change Materials (PCMs)

Thermal energy storage (TES) is considered as one of the most important advanced energy technologies, and an increasing attention has been paid to utilization of the technique for thermal applications. Latent heat thermal energy storage based on **Phase Change Material (PCM)** is one of the most preferred forms of energy accumulation, because of its high storage density and small temperature variation from storage to retrieval. A phase change material can absorb or release a large quantity of latent heat when it changes phase from a state to other one. PCMs have been applied in many fields, such as solar energy storage, waste heat recovery, thermal protection systems, intelligent air-conditioned buildings and electronic apparatus.

SOLUTIONS proposed by TEKNIKER



TEKNIKER, with its expertise in the development of coatings and Phase Change Materials for a wide range of applications offers diverse solutions in the solar field:

- 1** ➔ **NEW FORMULATIONS** of molten salts and HTFs with PCMs/nanoadditives in order to avoid super cooling, corrosiveness...
- 2** ➔ The design of **COATINGS FOR THE HEAT EXCHANGERS** to avoid the solidification of the fluids inside them.
- 3** ➔ **THERMOFLUIDIC MODELING** of the transition of the PCMs for all the range of temperatures to predict the behavior of the PCM in the final application.



CHARACTERIZATION OF PCM

| PROPERTIES | TECHNIQUES |
|------------------------|---|
| Thermal analysis | Differential scanning calorimeter (DSC) with pressure Thermogravimetric analysis (TGA) Thermal diffusivity analysis |
| Mechanical analysis | Instron, Impact pendule |
| Spectroscopic analysis | FTIR, NIR, UV-Vis |
| Surface analysis | Surface analyzer BET, nanosight (DLS) |
| Microscopic techniques | Atomic force microscopy (AFM) scanning electron microscopy (SEM), confocal microscopy, optical microscopy |
| Other | Dynamical-mechanical analysis, rheological analysis, electrical resistivity, tribological analysis, Wide angle X-ray scattering (WAXS)... |

THERMO CHEMICAL CHARACTERIZATION OF THE FLUIDS

| PROPERTIES | STANDARD | EQUIPMENT |
|--|------------------------|-------------------------|
| Cp | ASTM E 1269 | DSC |
| Melting Point | ASTM E 3417 | DSC |
| Thermal conductivity | ASTM E 1461, DIN 821 | Thermal Diffusivity LFA |
| Thermal stability | ASTM D6186 ISO 7111 | DSC TGA |
| Inflammability temperature (closed system) | ASTM D93 | Inflammability point |
| Inflammability temperature (open system) | ASTM D 3828 | Inflammability point |
| Freezing point | ASTM D 5950 | Freezing point |
| Viscosity (40 and 100°C) | AST D445 | Viscosimeter |
| Water content | ASTM D 6304 | Karl Fisher |
| High and Low boilers | ASTM D 2887 | Gas chromatography |
| Vapor pressure | | Home-made equipment |