Measuring the Thermal Conductivity of PCMs

Phase change materials (PCMs) are increasingly used in energy-efficiency initiatives for Thermal Energy Storage (TES) and for passive heating or cooling. PCMs are interesting because they store the thermal energy of a phase change, called the “latent” heat of phase change, on heating, and then when cooled, they can give off the stored heat by reversing the phase change (Figure 1).

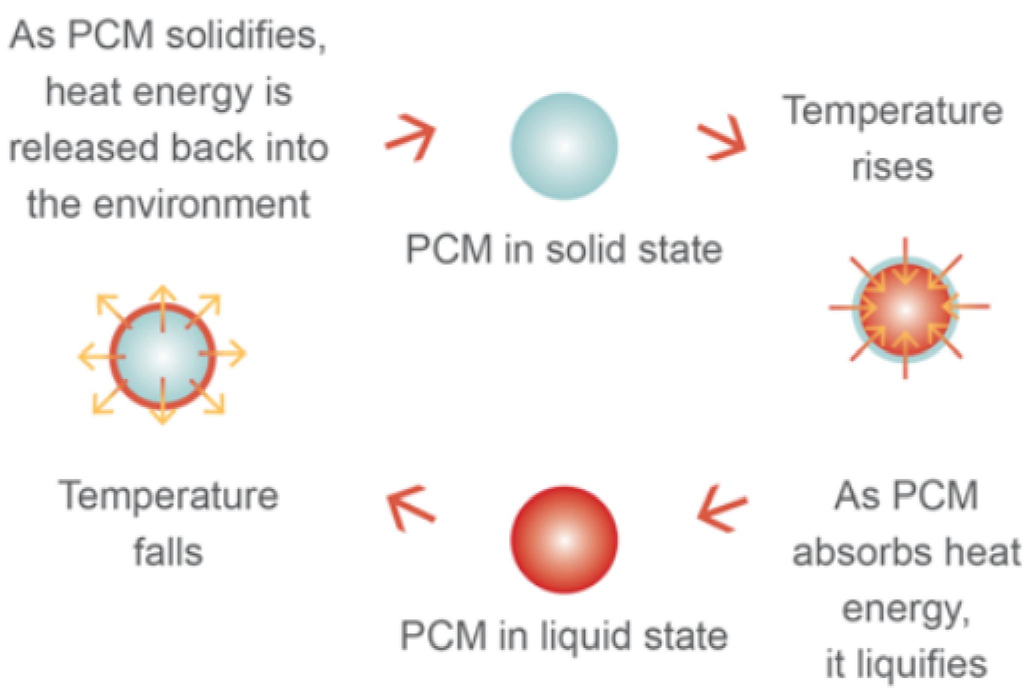


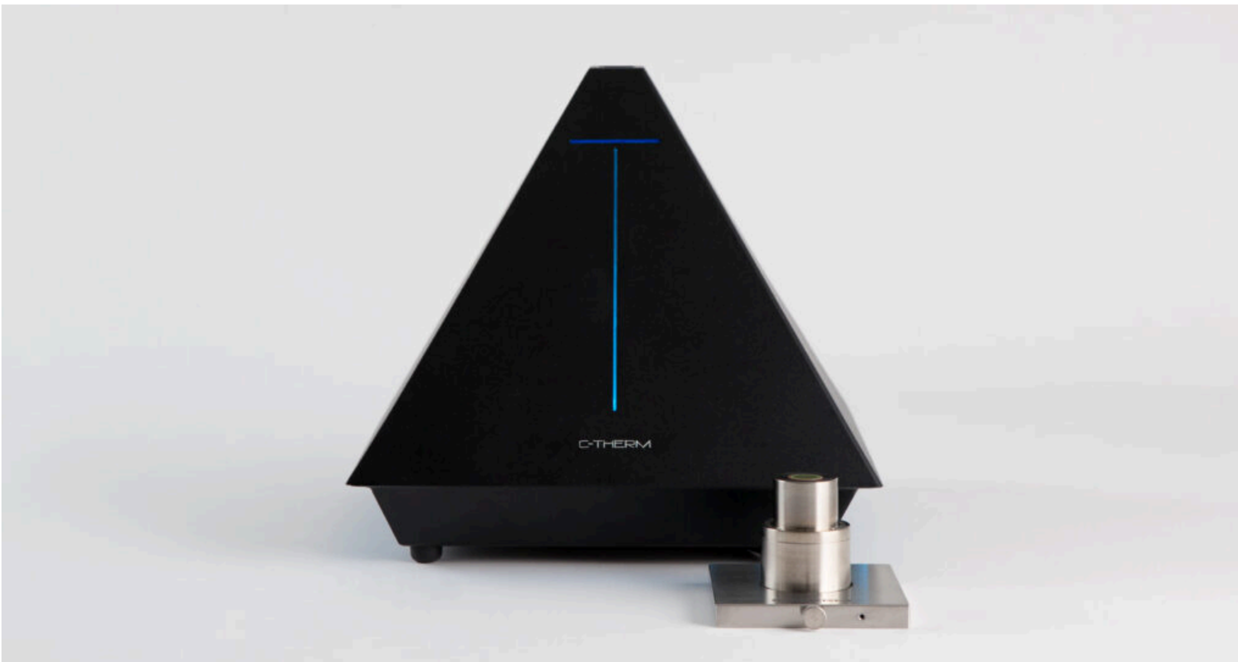
Figure 1: Phase Change Cycle of Common PCMs

PCMs are applied in an increasing number of applications including moderating daytime temperature variations in housing environments, optimizing thermal comfort in bedding, passive cooling of electronics and thermal management of batteries.

The ideal PCM is stable, chemically inert, non-flammable and has a high thermal conductivity to maximize the efficiency of the heat transfer during the phase change. Unfortunately, many materials which would otherwise make very attractive PCMs, such as paraffin and natural oils (e.g., coconut oils) are flammable, lose structural integrity with their phase change and suffer from low thermal conductivity. A highly competitive field of research has emerged to optimize the properties of these materials through the addition of additives in an effort to increase the effective thermal conductivity. The thermal conductivity is a critical attribute of the overall PCM's effectiveness.

MTPS Sensor with Liquid Cell

C-Therm's MTPS method is the ideal tool for characterizing the thermal conductivity of PCMs owing to its ability to test both the solid and liquid states of the material continuously.



Trident Instrument with MTPS