OGULAB.

[Nanospace for Environmental Protection, Resource Recovery, and Energy Storage]

Department of Materials and Environmental Science

http://www.ogulab.iis.u-tokyo.ac.jp

Lab for Environmental Catalyses and Materials Science

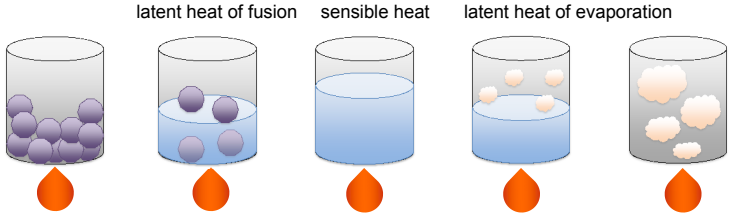
Department of Applied Chemistry

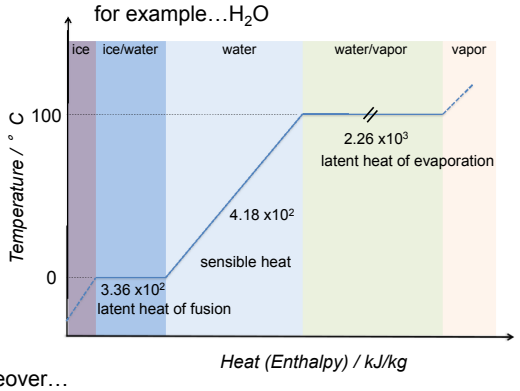
Uniform Nanospace for Energy Storage

D'où venons-nous? Que sommes-nous? Où allons-nous?

Phase Change Materials (PCMs)

solid⇄liquid⇄gas reversible phase change ＝ storage and release of latent heat
high energy storage density, storage/release of heat in a narrow temperature range,
wide applicability of various compounds

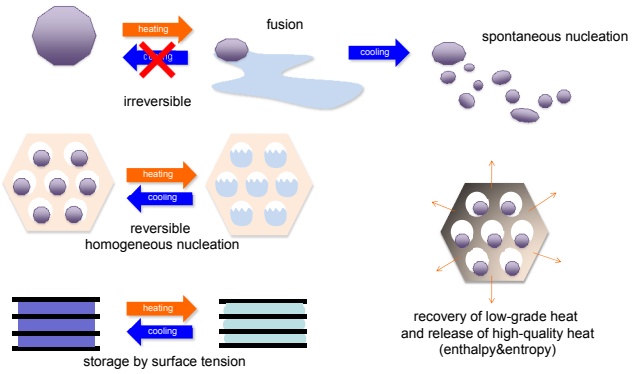




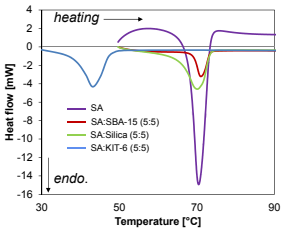
moreover…
stearic acid (higher fatty acid)：$C_{17}H_{35}COOH$…2.02 x10² kJ/kg@69 ° C
erythritol (natural sugar alcohol)：$C_4H_6(OH)_4$…3.40 x10² kJ/kg@118 ° C
paraffin (linear chain saturated hydrocarbon)：C_nH_{2n+2}…1.89 x10² kJ/kg@23 ° C

Energy storage by porosity

leak-free during phase & volume changes between solid and liquid
thin pore wall(～10 nm), small lattice parameter, diversity of materials (SiO_2, C, etc) = good thermal conductivity

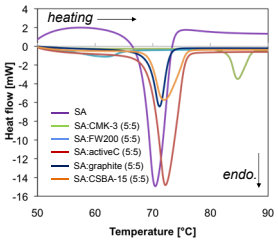


heat storage behavior on SA/silica composites



supercooling on stearic acid in KIT-6

heat storage behavior on SA/carbon composites

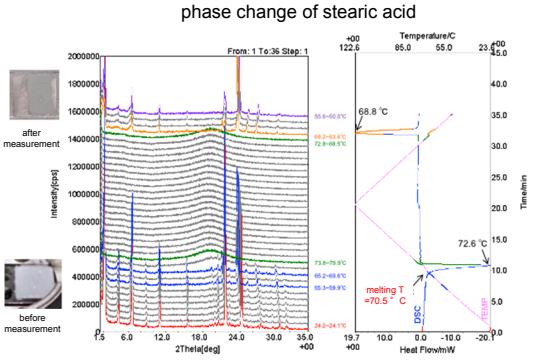


superheating on stearic acid in CMK-3

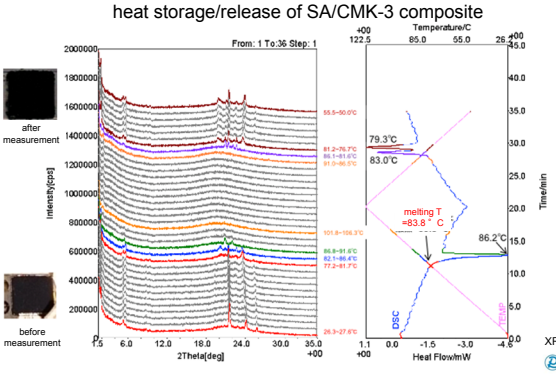
Phase change & Energy storage/release behavior

interaction between PCM and carbonaceous mesopore wall induces nucleation ＝ stabilization of solid state of PCM

phase change of stearic acid



heat storage/release of SA/CMK-3 composite



energy conversion by surface
energy storage by pore

XRD-DSC analysis by Rigaku Corp.