

Perfectly Uniform Nanocomposite

KRI has succeeded in making the nanocomposite which shows lower CTE than we expected in simple mixing rule. It is dispersed with uniform nanoparticles of <10nm into matrix polymer.

KRI will propose new R&D projects of making “perfectly uniform nanocomposite”. The key techniques are both appropriate selection of nanoparticles and their perfectly uniform dispersion into matrix.

Background & purpose

- Nanocomposite has led to give physical property improvement due increasing interaction between nanoparticles and polymer with increasing particle specific surface area. In the many cases, however, selection of nanoparticle size and their dispersibility are ended in the insufficient levels.
- The ideal nanosize-effect has been thought only to complete by forming perfect uniform nanocomposite using extremely small nanoparticle under more desirable dispersion.

Characteristics

1. Nanosize-effect

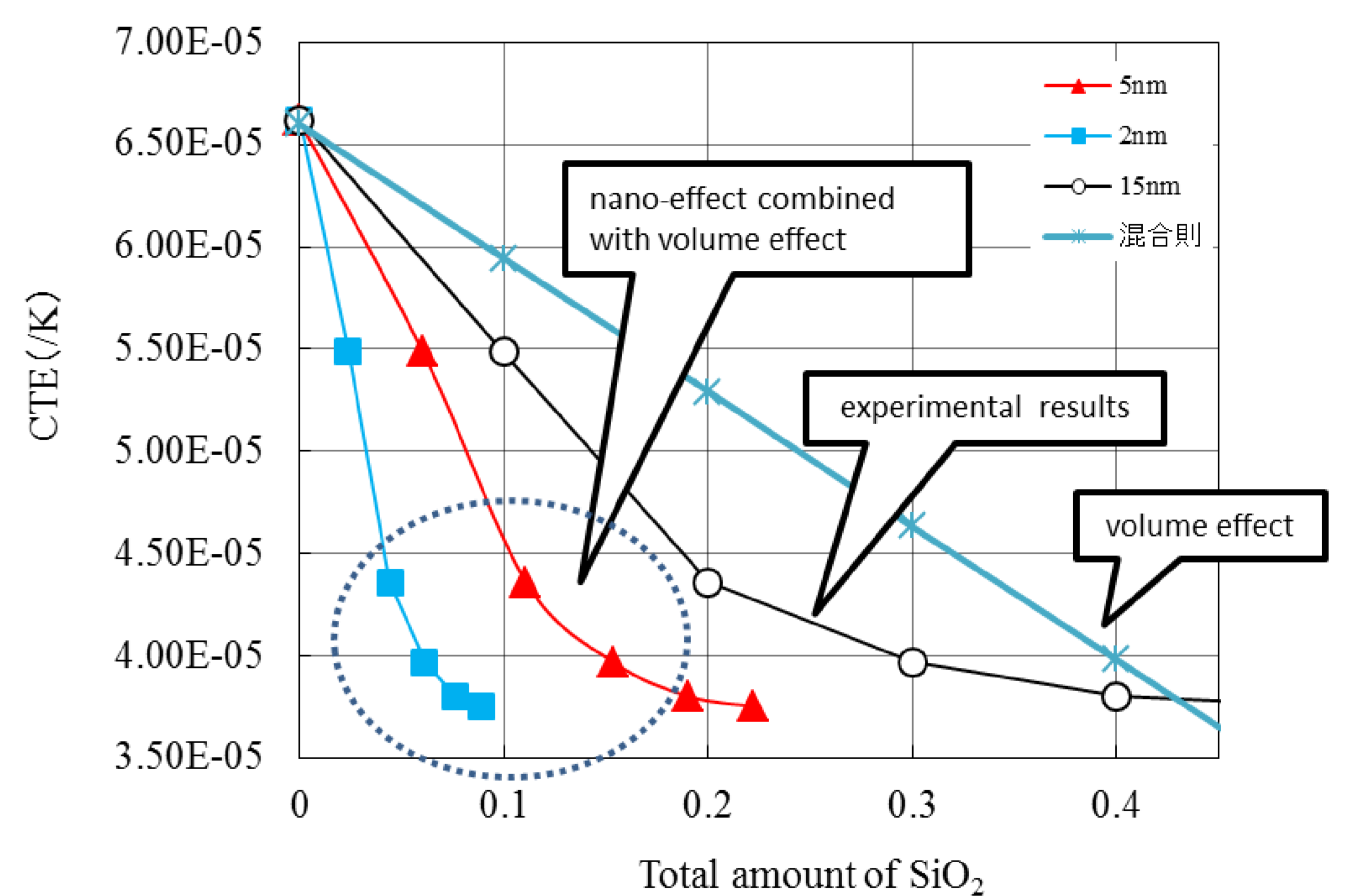
Nanoparticles (<10nm in diameter) have to stay in perfect uniform dispersion by adjusting interfacial affinity between particle and matrix. Under this condition, CTE of nanocomposite has been lowered remarkably by mixing slightly amount of nanoparticle.

2. Combination of nanosize-effect and volume effect

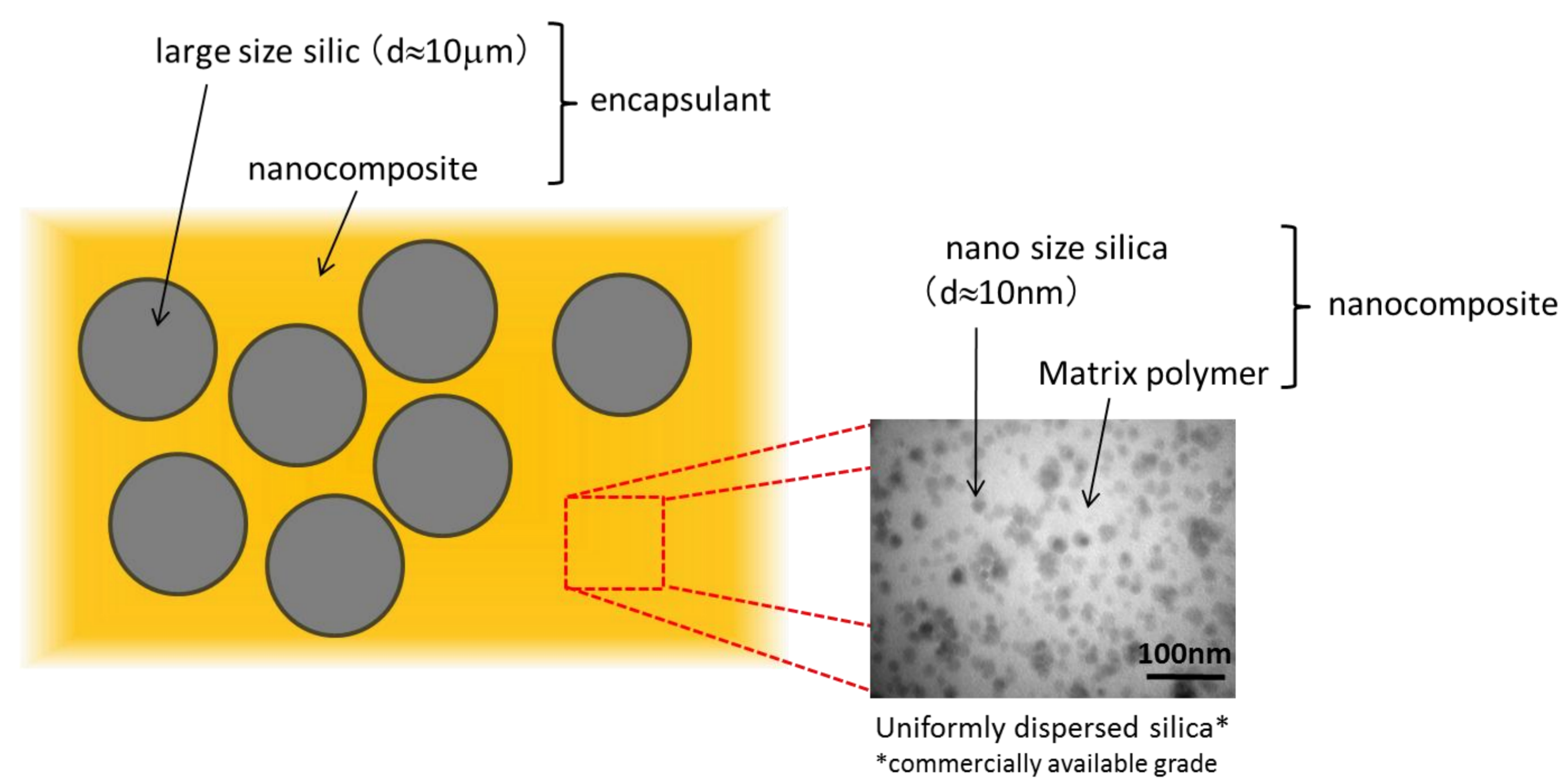
The most effective way to lowering CTE is combination of nanosize-effect and volume effect. KRI focuses on this concept as a reasonable solution.

Proposal form KRI

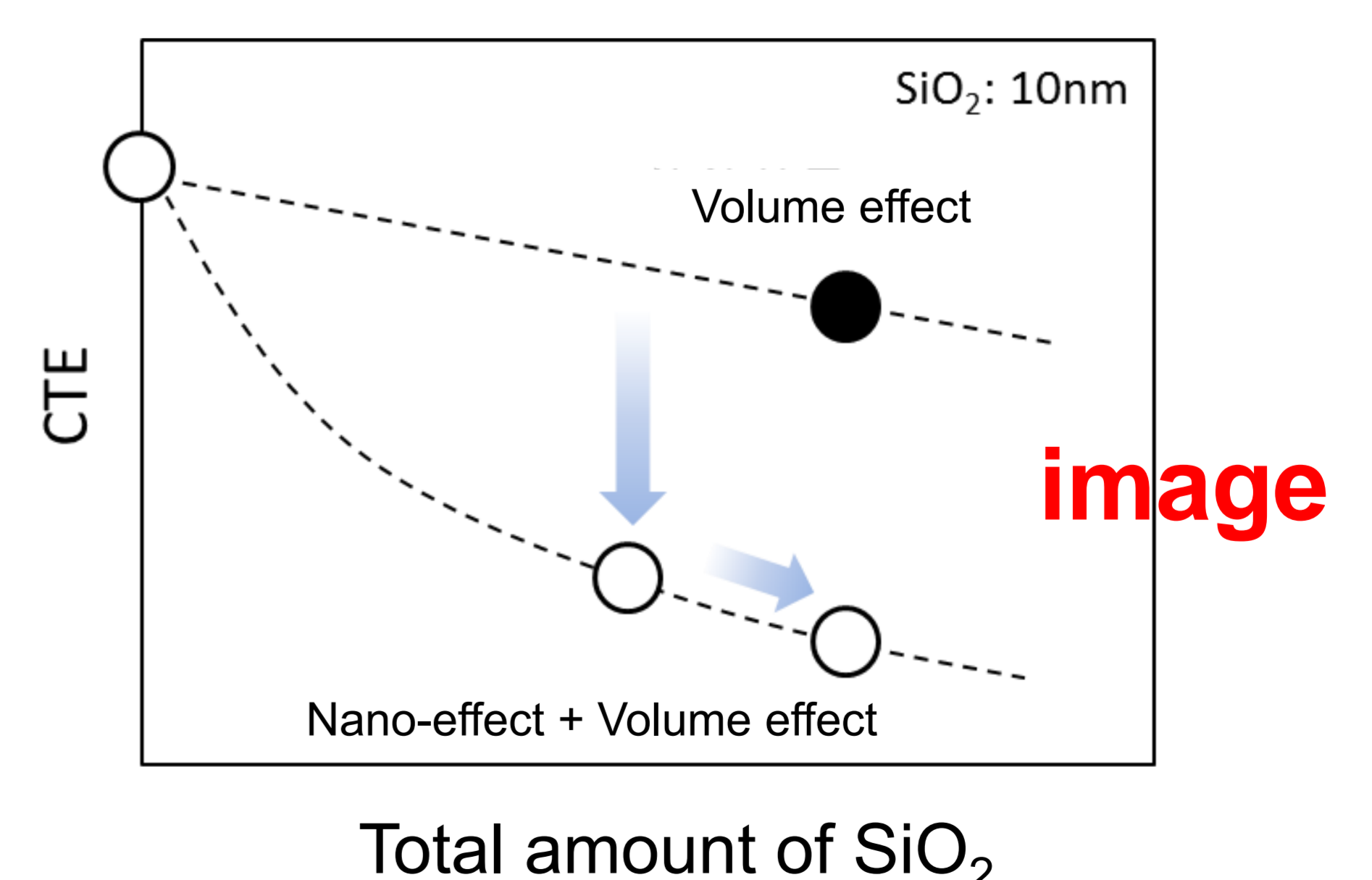
- Development of Low-CTE resin
 - Using KRI’s organic synthesis technology and/or hybrid with the inorganic compound such as polysilsesquioxane
- Development of encapsulant, interlayer insulation film
 - Target composite material using Low-CTE resin with highly dimensional stability and another inorganic filler
- Development of functionalized adhesive
 - Target composition with accurately controlled CTE, with gradient characteristics



CTE change of perfect uniform nanocomposite



Schematic illustration of low-CTE nanohybrid material



Effect on the CTE change brings about the combination of nanosize-effect and volume effect

PAT.PEND.