

Thermal Expansion/Contraction

Thermal expansion/contraction is less of a mechanical phenomenon and more of a thermodynamic event. Thermal expansion is the result of increased free-volume that arises from the added vibrational (thermal) energy. The more you heat the polymer, the more it vibrates, creating additional free-volume around each molecule, thus expanding the volume of the part.

Inorganic fillers and reinforcements experience the same phenomenon, but to a lesser degree --- about an order of magnitude less than organic polymers. Thus, adding inorganic fillers will reduce the change in volume (or linear dimension) based on its content in the composition --- not through any reinforcing effect.

Also remember, the coefficient of linear expansion is not linear. The coefficient of expansion is fairly constant up to the Glass Transition Temperature (T_g). It changes significantly in the glass transition region and again in the rubbery plateau.

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