# Nanoclay Fillers

## Mechanical Properties

Toyota Central Research Laboratories in Japan reported work on a Nylon-6 nanocomposite .for which a very small amount of nano filler loading resulted in improvement of thermal and mechanical properties. They also find out that at low filler loadings, , polymers reinforced with clay minerals have similar mechanical properties to polymer nanocomposites. Modification of mechanical properties and enhancement of modulus and strength is the significant reasons to incorporate functional fillers into polymers. Studies and modelings using continuum mechanics reveal that the enhanced properties of nanocomposites are strongly dependent on the particular features of nanofiller system, in particular, its content, aspect ratio and the ratio of filler mechanical properties to those of the matrix. Natural fiber/nanofiller hybridization in polymers lead to lower water uptake and improved mechanical properties. The value added properties enhanced without the sacrificing of pure polymer processability, mechanical properties and light weight, make the clays more and more important in modern polymer industry. However the poor compatibility causes a poor physical attraction between the organic and inorganic components, resulting in agglomeration, and therefore, weaker mechanical properties, and thus low barrier resistance at the same process conditions. [1]–[6]

## Carbon Nanotubes

Nanofillers can be classified according to their morphology, such as particles that are (i) spherical (e.g., silica) (ii) acicular (e.g., whiskers, carbon nanotubes) or (iii) layered (e.g., clays). The most frequently tested nanofillers are graphene nanoplatelets (GNP), carbon nanotubes (CNT) and nanoclays montmorillonite (MMT) and kaolinite. Various inorganic nanomaterials were used as nanofillers such as graphene oxide, zinc oxide, carbon nanotubes, graphite, cuppor oxide, aluminum oxide, tin oxide, cerium oxide, titanium oxide, silica nanoparticles, carbon nanofibers, layered double hydroxide and nanoclays. Nanoclay is the most common nanomaterials used so far. Polymer composites with the high aspect ratio of nano-fillers such as carbon nanotubes, nanofibers and platelet clays are in focus because of their highly enhanced properties and their unique multifunctional properties.Dispersion of single-wall carbon nanotubes (SWNTs) and higher concentrations of multi-wall carbon nanotubes (MWNTs) into a polymer matrix is currently the biggest challenge due to the aggregation of the nanotubes as a result of the van der Waals interactions between individual tubes. Carbon nanotubes have disadvantage of being produced on a limited industrial scale at high prices. [3], [5], [7]–[12]