Tactoids

1. The term conventional composite or microcomposite is also used to describe the structure of nanocomposite containing the clay tactoids with the layers aggregated in unintercalated form. One of the most commonly used organically layered silicates is derived from montmorillonite (MMT).
2. **Nanoclays in their pristine form are hydrophilic, thus incompatible with most polymers. Their nanoplatelets tend to undergo face to face stacking, forming tactoids. These factors make the intimate contact between the polymer matrix and the nanoclay difficult. The most critical issue in polymer nanocomposite containing nanoclay filler is to breakdown/exfoliate the tactoids to the scale of individual particles during the dispersing process to form "true nanocomposite."**
3. Its structure is made of several stacked layers, with a layer thickness around 0.96 nm and a lateral dimension of 100– 200 nm. These layers organize themselves to form the stacks with a regular gap between them, called interlayer or gallery.
4. **The van der Waals interaction between unit layers leads to stack formation with the counterions in the interlayer spaces. These stacks ofunit layers are known as tactoids and occur in different shapes and sizes. In dry powder form, these tactoids associate to form large aggregates or granules.**
5. However, the nanolayers of the clay tend to stack face to face leading to agglomerated tactoids in nanocomposites, which may negate the properties of the individual components. The dispersion of the tactoids into discrete nanolayers is further hindered by the intrinsic incompatibility of hydrophilic clay and hydrophobic engineering polymers.
6. **Moreover, high surface area and energy of the nanoclays may highly induce formation of platelet stacking or tactoids thus inhibit full function of the nanoclays reinforcing nanofiller.**
7. **Therefore, surface modification of the clay nanofiller using organic surfactants is commonly performed to impart its hydrophobic characteristic and subsequently improve compatibility between the nanoclay and the hydrophobic polymer matrix. However, to obtain the fully exfoliated nanoclay is very challenging.**
8. **These indicate that the crystallite structure was not altered with the pre-dispersing process but the reduction in tactoid size occurred through the randomization in nanoplatelet ordering and orientation.**
9. **the MMT with larger tactoid and agglomeration can be more effectively delivered to cells, causing damage to the cell membrane. This is because; the agglomerated MMT has high tendency to form intracellular reactive oxygen species (ROS) which can induce cell membrane damage through localized oxidative stress. MMT with smaller tactoids can produce lower ROS level, thus lower cytotoxicity**
10. **Generally, the quality of organo-MMT dispersion and distribu- tion in the EVA matrix was slightly reduced as the nanofiller loading increased from 1 to 5 wt %. This was due to the collision between the nanoclay platelets that increase with the con- centration, thus leading to agglomeration and greater spatial restriction for the tactoid delamination.**