EMAC276 Polymer Properties and Design, Homework #5, Prof. L. Zhu

Nanoscale inorganic materials are promising to enhance the physical properties for polymers, provided that they can be uniformly dispersed in a polymer matrix. One successful example is the nylon-6/clay nanocomposites developed by Toyota. Please read the review article by Dr. Arimitsu Usuki at Toyota CRDL:
https://www.tytlabs.co.jp/en/review/issue/files/471_045usuki.pdf (PDF is provided in the HW#5 assignment)

Your assignment is to write a brief essay using the following format:

1. Introduction of the technology (5 points)
Clay nanolayers usually have a strong tendency to aggregation due to strong van der Waals and electrostatic forces.
How did the Toyota researchers exfoliated clay nanolayers and disperse them in the nylon-6 matrix?
In other words, why can we not directly blend nylon-6 resin and clay in the molten state to achieve the desired nanocomposites?

2. Proposal of a potential application (5 points)
Other than the timing belt cover application, what other potential applications or products can you use the nylon-6/clay nanocomposites for? Please provide one example.
Why is your chosen example a good application for the nylon-6/clay nanocomposite?
What physical property is improved by the addition of clay nanoplatelets in nylon-6?
For your proposed product, what kind of polymer processing would you suggest?

3. References (if any)

Format:
Times New Roman font, 11 pts., 1" margin on all sides, double spaced, two pages limit. References are not count within the page limit. No abstract is needed. Submit via Canvas.

Due Date:
March 28th, 2025, mid-night (at 11:59 pm).