

# **Evaluating the Impacts of Nanocomposites via Life Cycle Analysis**

by

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Over the past decades, the volume and range of nanocomposite materials have been increasing rapidly. Nanoscale materials are added to polymers modifying or improve their properties such as mechanical or heat stability, the barrier for water and air, fire retardant, optical and electrical properties. The incorporation of nano-fillers into crystalline or glassy state of the bulk samples has led to significant change in the structure as well as the morphology of the samples. The stability of polymeric nanocomposites during the use phase and at the end-of-their useful life is not entirely understood. The potential release of nanomaterials from polymer matrices becomes a concern as a high volume application of nanocomposite is coming real. The degradation polymeric nanocomposites depend on the properties of the polymer and aging conditions. Energy, material use, and emissions during the manufacturing phase of nanocomposite materials are much higher than the amounts of the conventional materials. However, nanocomposite materials are lighter and require much lower energy during the use phase. Lifecycle risk assessment of nanocomposites includes the potential release of nanomaterials during manufacturing, use and end-of-life management. It is critically important to understand the relationship between the inherent characteristics of nanocomposite based consumer products and the likelihood of the release of nanomaterials throughout the life-cycle of the product. The goal of this study is to discover problems with emerging technology before it is developed fully and adopted, and guide the development of nanotechnology to be environmentally benign and sustainable. It also helps policy maker to understand better the environmental impact of nanomaterials over their life-cycle.