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Publication date:
2011

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Citation (APA):
Miseljic, M., Olsen, S. I., & Hauschild, M. Z. (2011). *LCA as an environmental technology development performance indicator of engineered nano-materials and their application in polymers*. Abstract from 3rd NorLCA Symposium, Helsinki, Finland.

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LCA as an environmental technology development performance indicator of engineered nano-materials and their application in polymers

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Engineered nano-material (ENM) application in products has in recent years developed to an important market segment but with rising environmental concerns, as the environmental life cycle impacts, especially toxicity of nanoparticles, are not assessed. Life cycle assessment (LCA) is a holistic tool to assess products and systems, but current knowledge about the development of ENM's environmental impacts is too scarce to be included for application within the LCA framework.
In the EUFP7 project MINANO the aim is to develop an efficient, continuous method of large-scale, low cost synthesis of ENM's with functionalities of flame retardancy, UV protection and antimicrobial properties through functionalized $Mg(OH)_2$, ZnO and Ag nanoparticles. The aim is also to apply the ENM's in plastic and wood-plastic matrixes and thereby develop products that have a new and improved way of attaining these properties, compared to the conventional ways of attaining these in the polymer product industry. To assure environmental sustainability LCA will be performed within the MINANO project and more precisely comparing the new ENM technology and the conventional technology approach to attain the same functionalities. The LCA in the MINANO project is aimed to be holistic and thereby include the entire life cycle of the nano-polymer products and not be like the current frequently applied nano-material LCA case study approaches where the life cycle is reduced and system boundaries substantially limited. In order to perform accurate assessments LCA needs to be further developed and adjusted according to this material class as there is currently a large uncertainty related to the chemical and biological interactions and toxicological properties of ENM's during their life cycle.