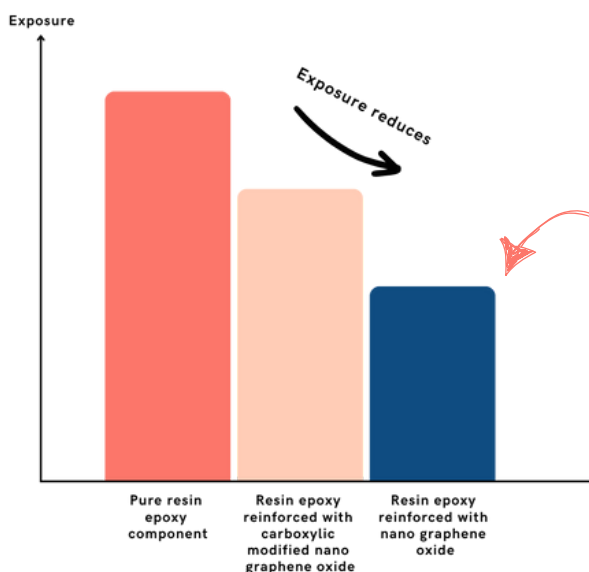


Exposure estimation to enable Safe-by-Design

Risk to nanomaterials is conventionally known to be a combination of exposure & toxicity of the substance. For a reliable preventive SbD risk-based approach towards product design, knowledge of exposure is important to determine the associated risk level. If the worker/consumer exposure to nanomaterials is known to be low or almost inexistent during an activity, the risk can be neglected. On the other hand, if the exposure is high, one can use the SbD approach to lower the risk proactively by taking appropriate exposure mitigation measures. Within WP4, we worked on developing "Nano Exposure Quantifier" tool and coupled it with a SbD module to not only estimate inhalation exposure for a large range of activities, but also to assist the user to lower it by adopting several SbD relevant measures.

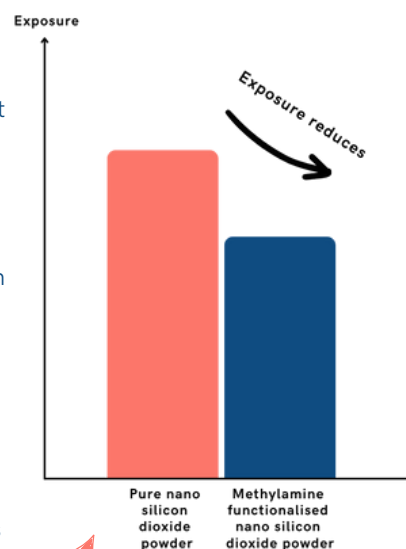
Reduction in exposure using SbD approach



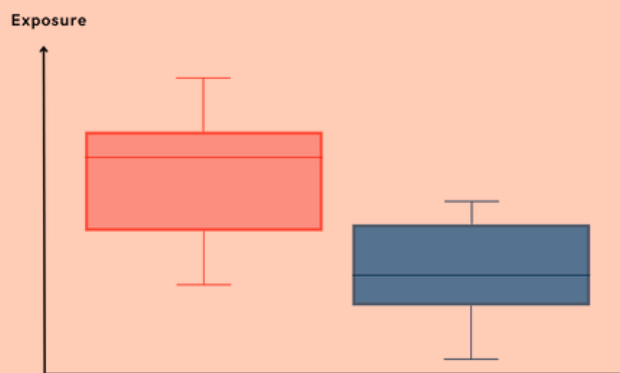
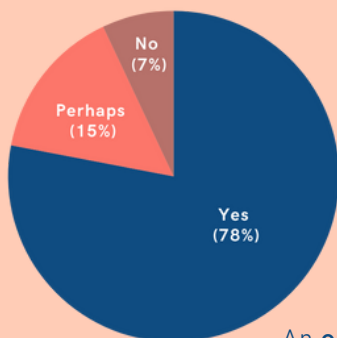
The exposure during processing or handling of nanomaterials (or nano-enabled objects) can be reduced by making relevant changes in the product and/ or process design.

For instance, exposure during the abrasion of epoxy resin plates has been observed to reduce by reinforcing nano graphene oxide in it.

Similarly, exposure during the pouring of nano silicon dioxide powder has been observed to reduce by functionalising its particles surface with methylamine group.



Nano Exposure Quantifier and SbD (NEQ-SbD) tool



An online survey showed that a large number of stakeholders deem the development of an exposure assessment model, like NEQ-SbD, to be useful. Based on the practical stakeholders' needs in the field of nanomaterial safety, the NEQ-SbD is an *in silico* tool which estimates inhalation exposure for wide range of activities & provides users with possible SbD alternatives to reduce the exposure level. It is now an integral part of the SbD4Nano e-infrastructure.

E-cards within the NEQ-SbD tool provide guidance to users in making informed decisions regarding SbD. Focusing on engineering and administrative controls, they offer practical insights into risk management measures by simplifying the implementation of effective risk management practices in workplaces where nanomaterial exposure is a concern.

