

## Impact on the nervous system of aerosols released from nanocomposite materials under stress use : The “Release\_NanoTox” project

Stéphane Delaby<sup>1</sup>, François Gaie-Levrel<sup>2</sup>, Marlène Wiart<sup>3</sup>, Anna Bencsik<sup>4</sup>

<sup>1</sup>Centre scientifique et technique du bâtiment (CSTB), Grenoble, France

<sup>2</sup>Laboratoire national de métrologie et d'essais (LNE), Paris, France

<sup>3</sup>Inserm U1060, Université Claude Bernard Lyon 1, CarMeN, Lyon, France

<sup>4</sup>ANSES, Unité Maladies Neurodégénératives, Lyon, France

Keywords: released aerosol, nanocomposite materials, *in vivo* inhalation study, chronic exposure, central nervous system, magnetic resonance imaging, neurotoxicity

Presenting author email: stephane.delaby@cstb.fr ; francois.gaie-levrel@lne.fr

The market of the nanomaterials in the construction industry (TiO<sub>2</sub>, NTC, SiO<sub>2</sub>, Ag, ...) is growing exponentially (van Broekhuizen et al., 2009, Som et al., 2011). However, many questions are still open concerning the impact of these nanomaterials on human health and environment. The degradations induced by the abrasion mechanisms of nanocomposite materials could induce the release of nanoparticles into the environment and today the chemical nature, size and concentrations are unknown. Moreover, the health impact of these particles are unknown. As nanoparticles inhaled through the nose can translocate to the brain directly via the nerve endings of olfactory neurons, an impact on the nervous system can be suspected, especially in case of chronic exposure (Bencsik 2014).

The aims of the research project “Release\_NanoTox” is to determine by a realistic approach, the impact on the central nervous system of particles released from nanocomposite materials under stress use. The project is structured in three main tasks:

- Characterization of aerosol emissions from nanocomposite materials under stress use;
- Characterization of the setup of exposure;
- *In vivo* study of neurotoxicity in rodents after chronic inhalation exposure to released particles.

The main originality of the project consists in the convergence work on particle released from nanocomposite materials and the study of the *in vivo* toxicity of nano-objects. Indeed, the work on toxicity is to date focused on the impact of nano-objects only. However, it has been shown that the wear of a nanocomposite material leads to the production of polymorphic particles in size and composition, with a majority of particles consisting of nanoparticles encapsulated in the matrix material. The chemical composition of the nanocomposite material's matrix is a factor that is not taken into consideration in toxicology studies. Similarly, no study has focused on the toxic effect of particles from a nanocomposite material.

This poster presentation aims at presenting the Release\_NanoTox project with a focus on the metrological characterization of the experimental set-up used for aerosol generation, from the generator up to the exposure chamber. First results concerning the characterization of aerosol generation system will be presented.

Release\_NanoTox has been awarded a grant by the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) in 2015 for 3 years.

van Broekhuizen, F.A. and van Broekhuizen, J.C. (2009) *Nanotechnology in the European Construction Industry, State of the art*, Executive Summary. European Commission.

Som, C. et al. (2011) *Environment International*, **37**, 1131-1142.

Bencsik A. *Is the brain protected from the impact of nanomaterials exposure?* (2014) *Biol Aujourd'hui* **208**(2),159-165.