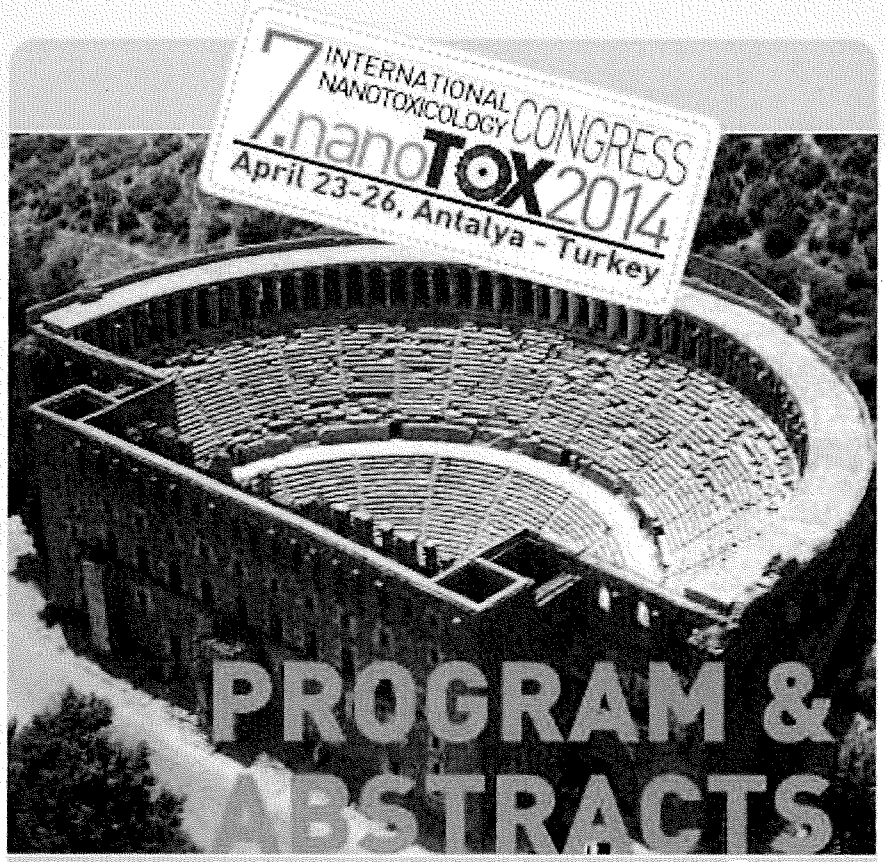

Under the auspices of the Turkish Society of Toxicology

TÜBİTAK

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operator [2]. These results will be displayed and discussed along with discussions of the process. Analysis by Nanoparticle Tracking Analysis (NTA) allows simultaneous measurements of particle size distribution, concentration, and fluorescence, and as such provides detailed information on nanomaterial characteristics throughout the lifecycle [3].
Standard NTA equipment (comprising laser source, temperature control, optics, sensors, and tracking and processing software) from NanoSight (Salisbury, UK) was then used to allow characterisation of diverse nanomaterials dispersed in a range of environmentally relevant media as part of the NanoMile project.
We will present data of time resolved particle behaviour of a range of particles in 3 media relevant to toxicological studies. These include PBS, FBS and Zebrafish embryo media. NTA analysis demonstrates that nanoparticle dose and particle size distribution depend strongly on both dispersant medium and the length of time spent in the medium. Factors such as ionic strength, temperature, and the presence or absence of biomolecules and natural organic matter affect the behaviour of the particles within the medium.
Nanoparticle size distributions, concentrations, and characteristics exhibited in environmentally relevant media may be markedly different from those determined in simple aqueous solutions or reference buffers, influencing the dose-response relationship.
NTA is identified as an ideal, straightforward method for studying nanomaterials in real time, while they undergo changes in the medium in question.
[1] Royal Society of Chemistry and Royal Academy of Engineering, Nanoscience and Nanotechnologies: Opportunities and uncertainties. 2005. , [2] Hole P, Sillence K, Hannell C, et al. 2013. Interlaboratory comparison of size measurements on nanoparticles using nanoparticle tracking analysis (NTA). Journal of Nanoparticle Research 12: 1-12., [3] Bendre V, Gautam M, Carr R, Smith J, Malloy A. 2011. Characterization of Nanoparticle Size and Concentration for Toxicological Studies. J Biomed Nanotech 7:195-196.

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A novel system to test the stability of airborne nanoparticles agglomerates

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The stability of nanomaterial agglomerates is an important material parameter for estimating the particle size of airborne nanomaterials and also for toxicological studies. The aim of this study is to develop a system that effectively tests the potential of different type of nanomaterials to deagglomerate within a wide range of applied energies. The aerosol generation is achieved by mean of fluidic agitation. Air flow agitates nanopowders inside a generator and bring the aerosol to a sedimentation chamber, which eliminates micro-sized particles. Humidity controlled air is thenmixed with the aerosol to allow studying the humidity dependence of the deagglomeration process. Afterwards the sample enters a deagglomeration orifice. The pressure change and air speed is carefully controlled to ensure a range of shear forces can be applied onto the particles. In the end, the aerosol is brought into a stabilisation chamber before it is measured by scanning mobility particle sizer (SMPS) and optical particle counter (OPC) for particle size distribution and number concentration, and collected onto transmission electron microscopy (TEM) grids for analysis of morphology. The aerosolization process has already been successfully tested with hydrophobic silica and titanium dioxide powder for which stable number concentration were obtained. The particle number and size distribution showed associations with the air flow rate supplied to the system. Higher flow rate gave higher number concentration and larger mean particle size. Therefore the flow rate needs to carefully controlled owing to the "flow-dependant" nature of the size in this system. Different air speeds (0.49-32 m/s) were generated by varying inlet tube size to activate the powder to investigate beforehand the de-agglomeration possibility at the moment the aerosol is generated. The initial experiments indicate that the particle size is reduced when high speed air flow impacts the powder, but this has to be verified with additional tests and other powders.
The preliminary results suggest that we are able to generate stable aerosols for later treatments with a range of shear forces under different humidity conditions. Initial tests employing different orifices to create shear force fields where the agglomerates pass through and get deformed. Control of humidity conditions between 30% and 70% (simulations of ambient environments) will allow insights of aerosol stability related to this factor. In addition, nanopowders from the MARINA material list will be tested to assess the robustness of the system and the behaviour of the system with other materials. The established approach will eventually enable the comparison between aerosolization setups and operational methods thus facilitates the establishment of standard testing procedures (SOPs) for deagglomeration tests of nanoparticles.

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Biological interaction of different-sized calcium carbonate materials in vitro and in vivo

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