Potential Occupational health risk from exposure to nano-scale particles from Photocopiers- A Pilot Study

Hamed Adetunji*hadetunji@brookes.co.uk, Luís Miguel Macedo Pinto[+], Ahsan Siddique* and Stephen Samuel[+]
* School of Health and Social care, +School of Technology, Oxford Brookes University, United Kingdom

Nano-technology, though very beneficial, brings along with it a range of health issues to people involved in the production or handling of these materials. Review and epidemiological investigations showed direct link between nano-scale particles and adverse heath effects especially the cardiovascular diseases. Since occupational health and safety primary aim is to prevent diseases in the workers, preventive and control measures proportional to the risks will be crucial only if the risks are known, quantified and documented. At the moment this is not the case.

Objectives: To measure the nano-particle emitted by the photocopier; to identify whether there is an increase in the levels of airborne nano particles in the photocopier room (when in use and at no activity time); to report the findings in terms of particle count and size distribution of nano particles and to suggest if there are possible adverse occupational health effects.

Method: A room (approx 4 x 5 x 3 m) with an industrial heavy duty Photocopier was chosen for investigating nano particles emitted from the photocopier. A real time fast particle spectrometer (DMS 500) was used to measure the total number and size distribution of aerosol particles ranging from 5 to 1000 nm. Continuous measurements were taken at the breathing height of an average person standing close to the photocopier. To establish a base value, measurements were taken overnight (12 hours) when there was no activity in the photocopier room. The size distribution of the toner was measured using DMS 500 by injecting the toner in the air stream close to the intake of the instrument. Test measurements were carried out during the day over 5 working days when the photocopier was in use. This was then compared with the base value taken during the night and with the size distribution of the toner.

Results: The measured data showed significant changes in spectral density and cumulative count. The nano-scale particle count in the room increased 11 times when the photocopier was in use as compared to when there was no activity in the room (Figure 1). The size distribution showed (Figure 2) a strong correlation with the size distribution of the photo copier toner, suggesting the photo copier as the main source for the increased nano-particle count in the room. This study also identified the settling time for the nano-scale aerosol in the work environment as 12 hours with the existing ventilation system.

Conclusion: This pilot study highlighted the effect of photocopier on nano-scale particle count in the work environment. It concludes that the increased levels of manufactured nano-particles in the photocopier work environment may have adverse effect on health of workers with longer term exposure to it. Therefore further investigation to evaluate what potential occupational health risks in particular posed by these findings is recommended.

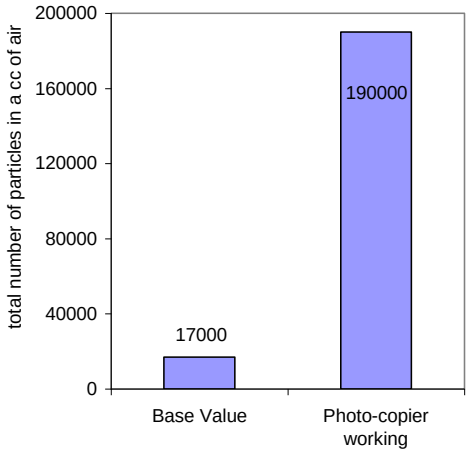

Figure 1: Effect of photocopier toner on ambient nano-particle size distribution

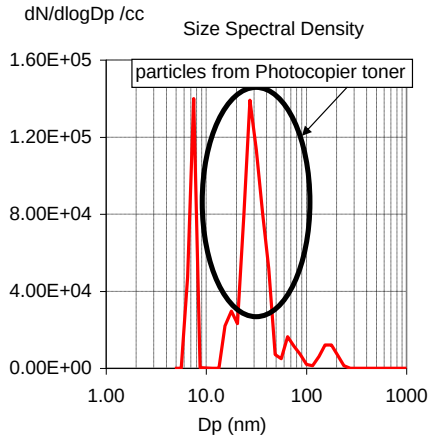

Figure 2, Nano particles emitted from Photocopier (nm GMD)