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ASSESSMENT OF PERSONAL EXPOSURE TO INDOOR AND OUTDOOR PARTICULATE MATTER FOR RESIDENTS OF AN ACADEMIC CAMPUS (IIT-KANPUR)

J. Jaidevi, T. Gupta*, S. N. Tripathi and K. K. Ujinwal

Department of Civil Engineering, Indian Institute of Technology-Kanpur.
**Corresponding author E-mail tarun@iitk.ac.in*

Scientific evidence strongly link human exposure to particulate matter to serious health problems, including respiratory and cardiovascular effects (WHO, 2005; ALA, 2004). Studies over the last 5 years in Kanpur have shown very high average concentrations of PM_{10} in the range of 202 ± 73.1 μg/m^3 (150μg/m^3, critical value according to the air quality standard in India) (Tripathi et al., 2006). The main objective of this study was to evaluate the total personal exposure, defined as concentration of pollutant measured near the breathing zone integrated over a specified time, to fine and coarse fractions of PM_{10} of a typical IIT-Kanpur resident in different microenvironments within the campus. Sources of particulate matter in a typical resident's daily lives can vary from cooking, cleaning etc. in the indoors to vehicular emissions, plants, resuspension of road dust etc. in the outdoors. Thus, in order to account for all the sources of particulate matter exposure, measurements were carried out in the most common indoor microenvironments like hostel dinning area, TV room, campus restaurant, office room, photocopy shop, and near the entrance to the campus to consider the outdoor environment.

A 15-channel optical aerosol spectrometer (particle size range 0.3-20 μm diameter, Model 1.108, GRIMM) was used to measure continuous, real-time aerosol number concentration and size distribution. The instrument works on the principle of scattering of light to measure the particle concentration. The instrument cannot be used when relative humidity > 80% and temperatures are outside the range of 4-45˚C. Using this instrument, the integrated exposure for one hour at different indoor microenvironments was determined. Both the effects of location and activity which, in turn, account for specific indoor sources and number of occupants, respectively were carefully evaluated. Re-suspension of particles due to movement of people was found to be a major source for increase in coarse particulate matter having aerodynamic diameter > 2.5 μm. On the contrary, combustion sources lead to an increase in fine particulate (diameter < 2.5 micron) matter concentration (Fig. 1).

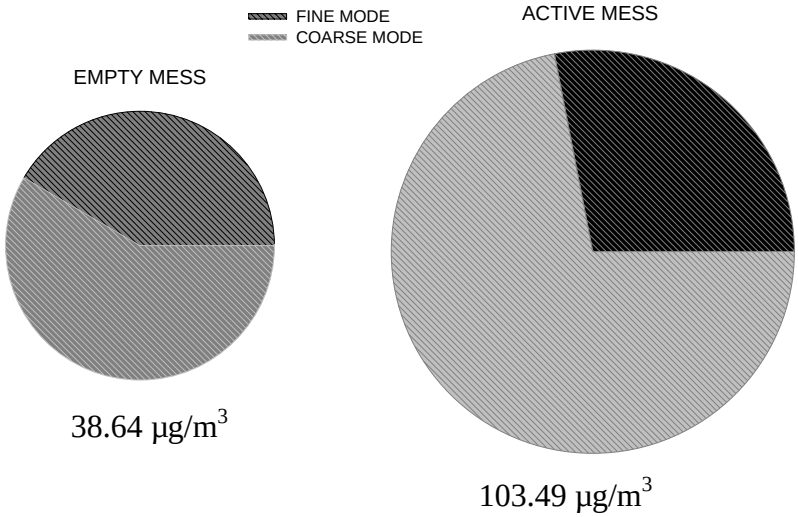

Fig. 1 Effect of activity on particulate mass concentration in the dining area.

Next, to assess the personal exposure for a resident making a day trip outside the campus, two study trips to two most common public places in the city, namely railway station and shopping complex, were made. The same instrument was used to measure continuously particle number concentration during the transit (public transport) as well as at the railway station and the shopping mall. In addition, to investigate the daily personal exposure of a typical student, a 24-hour exposure study was done on a student who also maintained a time-activity diary. Effect of different sources and activities were clearly seen and were correlated using the time-activity diary (Fig. 2).

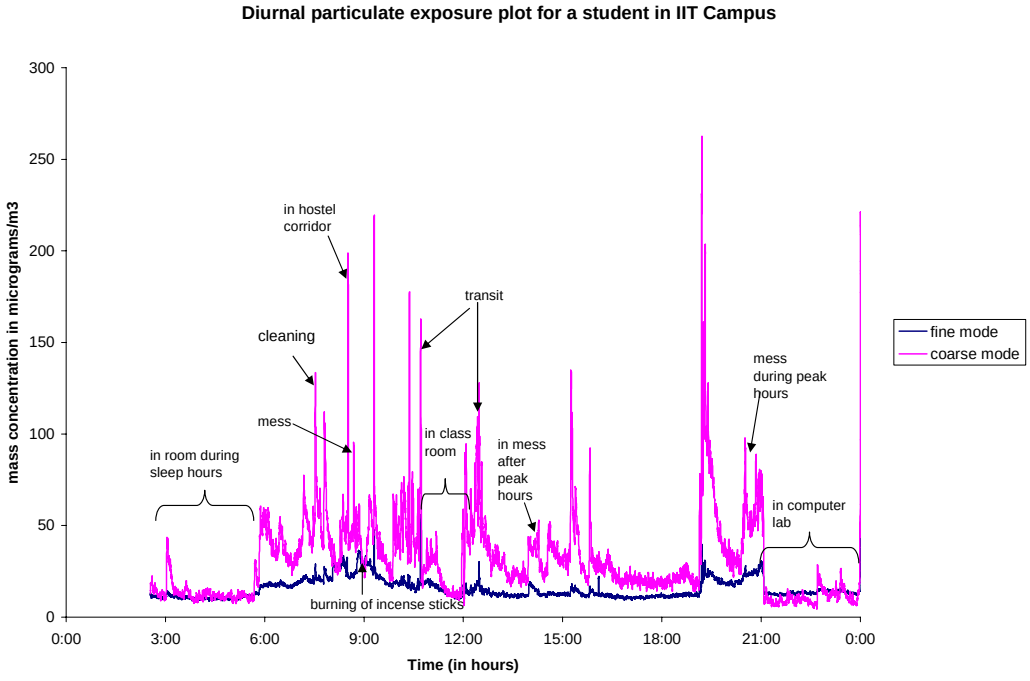

Fig. 2 Diurnal particulate exposure plot for a student in IIT Campus.

These and some other results will be presented in the proposed paper presentation.

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