Contribution of Inorganic aerosols and trace gases due to biomass burning during cooking hours at a rural site in India

Sudha Singh*, Gyan Prakash Gupta, Bablu Kumar and U C Kulshrestha
School of Environmental Sciences, Jawaharlal Nehru University
New Delhi, INDIA
Keyword: aerosols, biomass burning, cooking
(*Email: sudha29jan@gmail.com)

Biomass burning is a major source of air pollution which emits a complex mixture of air pollutants in the form of gases and aerosols (Andreae and Merlet, 2001). These have significant impact on atmospheric chemistry, climate change, and human health. But due to lack of measurements across the globe especially from developing countries, aerosol budgets have large uncertainties. There are reports on their emissions from coal combustion and wood burning from USA and Europe but measurements are very limited from developing countries. In India, traditional cooking is still common which contributes large amount of such air pollutants. This study has been carried out as part of UNEP project `Surya' to report chemical characteristics of fine atmospheric aerosols collected during cooking hours in an indoor environment in a village.

Measurements were conducted to determine indoor air pollution due to burning of wood, dung cakes and agriculture residue in rural households in Khairatpur village which is located in district Sultanpur of Uttar Pradesh state of India. Aerosol samples along with gaseous species (NO_2, SO_2, and NH_3) were collected during December 2010-January 2011 by using handy sampler (Envirotech model APM 821) installed inside the house. The samples were collected on 8 hourly basis using Teflon filters. The water extract of these filters was analyzed for major anions (F^-, Cl^-, NO_3^-, SO_4^{2-}) and major cations (Na^+, NH_4^+, K^+, Ca^{2+} Mg^{2+}) by ion chromatography (Metrohm 883 Basic IC Plus).SO_2 was estimated by using ion chromatograph and NO_2 and NH_3 were estimated by using spectrophotometer.

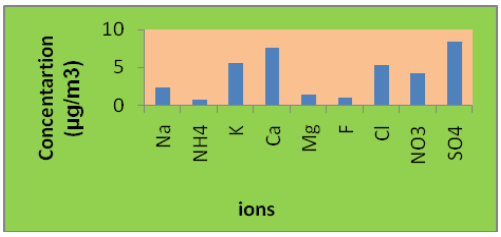

Fig.1 Concentrations (µg/m^3) of major ions during indoor cooking.

Fig.1 is the graphical representation of chemical composition of aerosol samples which indicates that SO_4^{2-} is dominant component followed by K^+, NO_3^-. SO_4^{2-} and Cl^-. Biomass burning is considered as a potential source of K^+ in air and its signature have been reported in Indian region (Kulshrestha et al., 2001). SO_4^{2-} which accounting for about 23% of the all components, is probably produced from the SO_2 emitted from biomass burning during cooking. SO_2 was recorded the highest among other gaseous species. Concentrations of gases are given in the Fig.2.

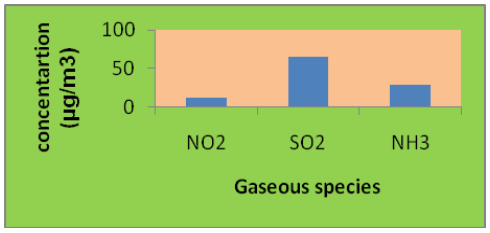

Fig.2 Concentration (µg/m^3) of trace gases during indoor cooking hours.

These findings indicated that a significant amount of aerosols as well as gases are contributed by biomass burning during traditional cooking process in rural India.

Acknowledgement: Authors sincerely thank RRC-UNEP-AIT, DST-PURSE, UGC and JNU for financial support.

References

Andreae, M.O., Merlet, P., 2001. *Emission of trace gases and aerosols from biomass burning*. Global Biogeochemical Cycles 15 (4), 955-966.

U C Kulshrestha, R Sekar, M Vairamani, Monika Jain, A K Sarkar, D C Parashar and A P Mitra. *Signatures of biomass burning over Indian Ocean during INDOEX*. IGAC Symposium, January 21-23, 2001, Bangkok, Thailand.