Chemical Characterization of Fine Particulate Matter at a Kerbside of National Highway in Delhi, India

Isha Khanna¹, Mukesh Khare¹, Prashant Gargava², B.K. Jakhmola², Namita Mishra²

¹Environmental Engineering, Department of Civil Engineering, Indian Institute of Technology, Delhi, India
²Central Pollution Control Board, Delhi, India

Contact: kharemukesh@yahoo.co.in

Objective: To evaluate the trace metals in ambient PM₂.₅ at a national highway in Delhi, India

Site Characteristics
- National Highway
- High Traffic Volume
- Mixed HDVs and LDVs
- 1,70,000 vehicles/day

Sampler Details
- PM₂.₅ Sampler: Ecotech APM 550
- WINS Impactor

Sampling Protocol
- Sampling Month: November 2013 (Winter)
- Sampling Frequency: Alternate Days
- Sampling Duration: 24-hour

Analysis Protocol
- Trace Metals concentration using X-Ray Fluorescence (XRF)

Results
- Out of twenty-three metals, eight metals are detected in the samples in significant amount.
- Si, being the crustal element, is found to be maximum i.e. 33%, followed by K, 21% and S, 20%.

<table>
<thead>
<tr>
<th>Si</th>
<th>S</th>
<th>K</th>
<th>Ca</th>
<th>Fe</th>
<th>Zn</th>
<th>Br</th>
<th>Pb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Si</td>
<td>1</td>
<td>0.589</td>
<td>0.871</td>
<td>0.956</td>
<td>0.944</td>
<td>0.419</td>
<td>0.075</td>
</tr>
<tr>
<td>S</td>
<td>1</td>
<td>0.735</td>
<td>0.502</td>
<td>0.526</td>
<td>0.151</td>
<td>0.049</td>
<td>0.062</td>
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<tr>
<td>K</td>
<td>1</td>
<td>0.853</td>
<td>0.891</td>
<td>0.298</td>
<td>0.179</td>
<td>0.025</td>
<td></td>
</tr>
<tr>
<td>Ca</td>
<td>1</td>
<td>0.976</td>
<td>0.572</td>
<td>0.068</td>
<td>0.14</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fe</td>
<td>1</td>
<td>0.484</td>
<td>0.088</td>
<td>0.125</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Zn</td>
<td>1</td>
<td>0.012</td>
<td>0.134</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Br</td>
<td>1</td>
<td>0.021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Conclusions
- Si has high coRelation with Ca, Fe and K - crustal origin
- S, Br and Pb - vehicular exhaust emissions and/or abrasions due to brake and tyre wear

Future work
- Seasonal concentration analysis along with ionic and organic speciation

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