SAMPLING AND ANALYSIS OF METALLIC POLLUTANTS IN THE ATMOSPHERE

D.G.G.P. KARUNARATNE AND W.M.N. GUNAWARDANA

Department of Chemical Engineering, Faculty of Engineering, University of Peradeniya

Even though countries like the USA recognised the adverse effects of lead related additives in petrol on human health and took steps to phase out leaded petrol a long ago, most of the Sri Lankan cars still use leaded petrol as fuel. Consequently, the atmospheric concentration of lead in urban areas in Sri Lanka may have increased considerably. Therefore, the measurement of its concentration is very important to understand the possible health risks as well as to convince the authorities about the severity of the problem. This paper reports the progress of a project, which was aimed at measuring the atmospheric concentration of lead in the Kandy city.

The measurement of lead includes sampling, sample preparation, and analysis. Lead in the air is basically present in two forms; condensed on to the particulates, and in the vapour phase. Sampling is done using a high volume air sampler, which draws the air sample and collects the particles that are greater than 10 μm in a cyclone separator, while smaller particulates are collected by a filter. The vapour is absorbed into a suitable liquid in an impinger. The sampler also keeps record of the total air volume drawn.

The sample preparation includes digestion of filter paper in a heated acid mixture to dissolve lead and filtration to remove particulates. This step is crucial as any impurities introduced can interfere with the final analysis of the compounds. Furthermore, minimising the sample loss and achieving a satisfactory level of repetition are important. As a result, the sample preparation was practiced extensively before doing any actual sample collection.

The sample is then analysed in an atomic absorption spectrophotometer. This unit draws the sample in liquid form, atomises, and introduces it to a flame. In the flame, the metal atoms are exposed to a light beam of the characteristic wavelength of the selected metals to be analysed. The atoms absorb this energy and attain excited state. The amount of energy absorbed is directly proportional to the concentration of metals in the sample. After calibrating with known concentration, the absorbance can be converted into actual concentration.