Solutions and implications for environmental issues using synchrotron research.

P. KAPPEN[1], M. KITCHING[2], G. ROE[3], AND P. PIGRAM[1,4]

[1] Department of Physics, La Trobe University, Victoria 3086, Australia; p.kappen@latrobe.edu.au
[2] Department of Primary Industries, Werribee Centre, Victoria 3030, Australia; matt.kitching@dpi.vic.gov.au
[3] Department for Industry, Innovation, and Regional Development, Australian Synchrotron Project, Victoria 3000, Australia; gerry.roe@iird.vic.gov.au
[4] p.pigram@latrobe.edu.au

Over the past few years, synchrotron research has globally been attracting increased interest in environmental sciences. In a number of cases, a clear overlap exists between environmental research and geochemistry. As an example, studies were dealing with the chemistry and speciation of heavy metal pollutants in soil and water systems. Furthermore, both fields, geochemistry and environmental sciences, benefit from the fusion with synchrotron sciences.

With the advent of the Australian Synchrotron (to be opened in 2007), the local scientific community will have a new tool to investigate environmental issues in new ways. Australia's stronger involvement with synchrotron sciences will also be of significant benefit for governmental research organisations and industry.

Using the links between environmental sciences and geochemistry, current and possible synchrotron applications in this interface will be discussed. The potential of synchrotron sciences in resolving challenges in environmental sciences will be highlighted. Case studies will include the chemistry of hexavalent and trivalent chromium in soils and timber products.

In the example of soils, X-ray Absorption Spectroscopy (XAS) was employed to speciate chromium in soils during a simulated Cr(VI) spill accident (simulation using a flow column set-up). The results show how relative concentrations of Cr(VI) and Cr(III) species evolve on different soils during the treatment. In an organic rich soil, chromium species are changing rapidly with in the first six hours of treatment, then appear stabilised. However, in a sand rich soil the speciation shows greater variability during the entire treatment (20 h).