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Vale Inco: CLS Sheds Light on Nickel Chemistry

Canada is one of the world's leading producers of nickel, and Vale Inco Limited is the country's foremost producer of the metal. While it has several key industrial uses, such as stainless steel production, the toxicity of different chemical forms of nickel vary substantially. Understanding the chemical differences that make some nickel compounds toxic and others harmless is crucial to meeting new regulatory requirements and validating safety standards.

Vale Inco is working with the environmental science team at the CLS to understand the chemical nature and potential toxicity of nickel particulates found in mines and in processing facilities, to protect workers and the environment.

"We've found that the CLS is a very powerful tool that provides a really thorough, clear picture of the chemical speciation of nickel that is encountered in the workplace," says Dr. Mike Dutton, Director of Environmental Health Science with Vale Inco. "The synchrotron gives us a great complementary technique to our own lab procedures."

"I think a lot of eyes in the mining industry will be opened by this work," he continued.

The research involves using X-ray Absorption Near-Edge Structure spectroscopy (XANES) to analyze the nickel-containing dust from air filters. The advantages of XANES

– including its sensitivity to changes in oxidation (chemical) state and its ability to measure all of the nickel in a given filter sample with little or no sample preparation – make it the ideal quantitative technique to use.

Dutton thinks the CLS provides a valuable pool of analytical expertise in a changing labour force where many organizations' in-house experience is depleting due to retirement, as well as a training ground for the next generation of highly qualified researchers.

"The kind of partnership we have with the CLS can go a long way to address this kind of demographic reality," he explains.

An example of this is a recent memorandum of understanding between CLS and MIRARCO of Sudbury, which will see young scientists and students working on projects that the two organizations are collaborating on, including research with Vale Inco.

Results from the initial air filter analysis are proving to be extremely useful when compared with more conventional 'wet' chemical tests, and will form the basis for further research as well as a joint Vale Inco-CLS paper at an upcoming international conference.

Dutton is already considering the next

project he wants to do at Canada's synchrotron.

"There's a further application we're working on, for which synchrotron techniques are the only tools available," says Dutton. "The data we're getting from our synchrotron work demonstrates that the CLS is a key resource for our technical operations."

Dr. Mike Dutton, Director of Environmental Health Science with Vale Inco.

