Institute Lecture

Metallurgical Emissions - ticking environmental bomb or a valuable resource?

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Thursday, 19th March 2015; 5.00 PM*
Venue: Lecture Hall Complex 17

Abstract of the talk:

The environmentally harmful emissions from metallurgical process industries pose a serious problem today, some examples of which are: (i) contamination of ground water by Cr(VI) from of stainless steel slags, (ii) lead contamination from TV cathode ray tubes and huge deposits of waste glass, (iii) ozone hole forming SO_2 emissions from copper plants, and (iv) aluminium dross resulting from melting of aluminium scrap. Great premium is now placed on research for rendering these wastes inert and also to view them as a source for important metals and chemical compounds, including nano materials.

In this talk, novel methods for recovering valuable metal/mineral resources from the metallurgical wastes developed by our research group in Sweden shall be discussed. Stainless steel is widely used all over the world. During the production process, the final slag contains about 8 wt % chromium as oxide. This slag, when dumped, gets leached slowly by rain water and contaminate ground water with the dreaded Cr6+. Even during the tapping of the Cr-containing slag, CrO_3 vapour is emitted risking the health of the workers. Studies worked out in Stockholm show that the amount of Cr in the slag could be minimized by using CO_2 as a decarburizer for stainless steel melts.

A new molten salt electrolysis process for the recovery of Cr from waste slags was also developed. This new process was successfully used to single step copper production practically eliminating the strong SO_2 emission during the existing process route. The process is also successful in recovering lead contamination from spent Cathode Ray Tubes from old TV sets as well as from the huge deposits of waste glass from the world-famous Swedish crystal glass industry. In the Electric Arc Furnace process, the final slag contains upto 30 % FeO and 10 % MnO. These slags form huge artificial hills. Oxidation of the slag leads to recovery of the metal values such as nano manganese ferrate, which is a very valuable magnetic material. During the remelting of aluminium scrap, the waste product, Al dross with the environmentally unfriendly AlN could be recycled completely adding significant value in the process.

It is time that the metallurgical industries wake up to meet these and similar challenges before it is too late.

About the Speaker:

Prof. Seshadri Seetharaman received his Ph.D. degree in Metallurgy from Indian Institute of Science, Bangalore, India, in 1971. He joined the Royal Institute of Technology, Stockholm, in 1973 as Senior Research Associate and became Associate Professor in 1981. He was installed in the Chair of Theoretical Metallurgy in 1990 and he retired from this position at the end of 2010. He has about 350 peer-reviewed publications in leading journals in Metallurgy, about 150 conference presentations, and 10 patents. He has edited two books. His major scientific interests are the fundamentals of Process Metallurgy that covers thermodynamics, transport phenomena, thermophysical properties of high temperature systems and interfacial phenomena. He was also involved in the teaching of the above subjects.

Prof. Seetharaman has been awarded the Brimacombe Prize for the year 2010. He is an Honorary member of the Iron and Steel Institute of Japan, Honorary doctor at the Aalto University in Finland, Honorary Professor at the Metallurgical Academy of Ukraine as well as at The University of Science and Technology Beijing. He also received the Distinguished Alumni Award of the Indian Institute of Science, Bangalore in the year 2013. He has been nominated eight times as the best teacher in Materials Design teaching program at the Royal Institute of Technology. He has been honoured by the Royal Institute of Technology President's Award in 1994 for meritorious contributions in teaching. He was selected as the best teacher of the Royal Institute of Technology in 2004.

All interested are welcome to attend.

Prof. K. Muralidhar
Dean of Research and Development

*Tea at 4:45 PM