METALLURGY

Dr. Michael Virnig

Dr Michael Virnig, currently Global SX Technology Consultant at BASF, is the 2015 inductee in Metallurgy. The leaching of ores – such as copper, nickel or cobalt – followed by solvent extraction (SX) has been practiced commercially since the late 1960s. Since this SX reagent introduction, considerable research efforts have taken place to make solvent extraction processes more efficient, more selective and more economical. Virnig has been a strong contributor to the advancement of these reagent extractants for over four decades – with considerable success.

After graduating with a PhD in Organic Chemistry in 1973, Virnig joined the research division of General Mills Chemicals, a company which later became part of the Henkel Corp. From the beginning, his focus was the development of new SX reagents for the recovery of metals from aqueous leach solutions. With changing job positions in his career – from Group Leader, to Head of Laboratory to Director of Technology – Virnig was responsible for numerous programs which targeted the development of new SX reagents and applications and providing technical support to customers at mine sites.

His primary contribution in the advancement of the SX process was the development of various LIX® products. He coordinated several production and manufacturing processes from the lab bench to commercial scale and directed research projects which account for the development of an extensive range of oxime extractants for the extraction of copper, nickel, silver or gold – such as LIX® 34, a sulphonamidoquinoline reagent for the extraction of copper from acidic leach liquors, LIX® 7820 and LIX® 79, for the recovery of gold and silver from alkaline cyanide leach liquors or LIX® 622N and LIX® 622, two isotridecanol modified aldoxime formulations for the extraction of copper from acidic sulphate leach liquors. Virnig retired in April, 2012. Since that time he has continued to work as a consultant in support of BASF Mining Solutions to the present time. As a result of his dedication and efforts, he is an inventor or co-inventor of 71 US patents and author or co-author of more than 30 technical papers on various aspects of metal recovery by solvent extraction and ion exchange technology in the mining industry.

Contributions at a Glance

- Development of LIX®34: A sulfonamidoquinoline reagent for the extraction of copper from acidic leach liquors
- Development of a manufacturing process for the production of LIX® 26, an alkylated 8-hydroxyquinoline
- Development of LIX® 622N and LIX® 622: Isotridecanol modified aldoxime formulations for the extraction of copper from acidic sulphate leach liquors
- Identified proprietary chemistry for the manufacture of the aldoxime copper extractant molecules: A process that has been used to produce many thousands of tons of aldoxime copper extractants for the Henkel's Mining Chemicals business
- Improvements of the LIX® 84-I manufacturing process: Resulted in a cleaner product with better physical and chemical application properties
- Developed LIX® 7820 and LIX® 79: Two families of novel solvent extraction reagents for the recovery of gold and silver from alkaline cyanide leach liquors
- Developed AURIX® 100: An ion

exchange resin based on the guanidine chemistry for recovery of gold and silver from cyanide leach liquors

- Contributed to the development of the Cawse Nickel flowsheet for the production of nickel metal from laterite ores
- Developed LIX® 84-IT: Which reduces chemical transfer of ammonia from extraction to stripping when recovering copper and nickel from ammoniacal feed solutions
- Developed LIX® 55 and LIX® 57: Improved beta-diketones for the recovery of copper from ammoniacal leach solutions
- Achieved 100% share in the Australian copper solvent extraction reagent market through targeted technical support coordinated with the efforts of the local representatives
- Cooperated with the BASF Cork plant in Ireland in developing improvements in ketoxime and aldoxime production that resulted in major expansion in capacity with very low capital expenditure
- Directed research projects that identified SX compatible surfactants with potential applications as copper tank house anti-misting aids and leaching aids
- Directed a research project that identified more stable copper extractants

Curriculum Vitae

1973 - Graduated from Iowa State University, US with PhD in Organic Chemistry

1974 - Research chemist at the research division of General Mills Chemicals (GMCI) in Minneapolis, US

1981 - Group leader at Henkel Corporation

1985-1986 - Head of laboratory at the Henkel Laboratories in Düsseldorf, Germany

1986 - Henkel research laboratories in Santa Rosa, US

1995 - Director of technology at Henkel's Mining Chemicals Group in Tucson, US