Research Conducted in the Department of Chemical Engineering

Research Focus Area: Mineral and Waste Materials Processing Group

• Extraction of Precious Metals from Spent Catalyst Via Solvoleaching

Description of research: This study aims to study solvoextraction of precious metals from spent refinery catalyst. The research seeks to develop a commercially viable and sustainable approach. The outcomes are expected to contribute to alleviating promoting circular economy principles, and generating employment opportunities, addressing South Africa's pressing energy and employment challenges.

• Extraction of Copper from Printed Circuit Boards using Solvometallurgy Process

Description of research: The rationale for this research lies in addressing environmental concerns while tapping into the economic potential of recycling metals from printed circuit boards. Solvometallurgy presents an opportunity for selective metal recovery, minimizing waste generation and environmental footprint compared to traditional methods. The potential value of this research is multifaceted. It can significantly reduce the environmental burden associated with printed circuit boards disposal and metal production while conserving natural resources.

• Application of Various Bleaching Solids on Hydrogenated Pretreated Waste Motor Vehicle Lubricating Oil

Description of research: The disposal of waste lubricating oil from vehicles is a serious environmental problem that requires innovative and sustainable solutions. One approach is to treat the waste oil using hydrogenation to remove impurities and produce a lighter, more stable product. However, the resulting oil may still contain some discoloured components that affect its marketability. Therefore, the use of bleaching agents may be necessary to lighten the oil and improve its appearance. The research will produce valuable data that could benefit the waste oil management sector and contribute to the mitigation of environmental pollution.

• Project-Based Learning in Engineering Disciplines Through Emerging Technologies. Project based in the FEBE

Description of research: Project-based learning is a widely recognized pedagogical approach that fosters active learning and problem-solving skills among engineering students. Over the past few decades, PBL has brought a significant transformation in engineering education by becoming a core methodology for moving towards engineering programs that support student-centered learning. Emerging technologies such as Virtual Reality, Augmented Reality, Internet of Things, Artificial Intelligence, Machine Learning, Robotics, Automation, Collaborative Tools, Cloud Computing can further enrich the PBL experiences. This research

will examine the effects of emerging technologies in enhancing PBL experiences within engineering education.

Research Focus Area: Green Engineering

- Water and wastewater treatment technology
- Bio and renewable energy
- Green hydrogen production technology
- Magnetic nanotechnology
- Green and environmental engineering
- Computational modelling and processing optimisation
- Chemical Thermodynamics
- Mining, Industrial Wastewater Treatment, Membrane Bioreactors, Acid Mine Drainage, and Geohydrology