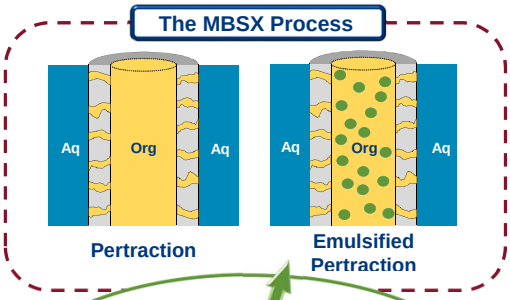
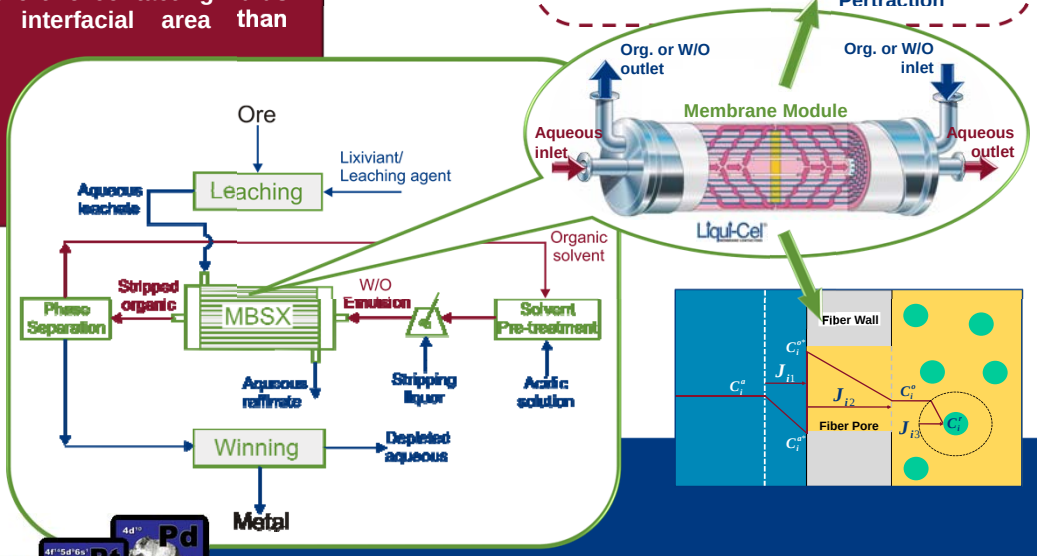
THE SELECTIVE SEPARATION AND RECOVERY OF METAL SOLUTES BY PERTRACTION

INTRODUCTION

Pertraction is a combined process of solvent extraction and membrane technology. This novel unit operation allows the contact of two liquid phases across the interface of a hollow fibre membrane, whereby the metal solute can diffuse between the two phases, without dispersing one phase into the other. The non-dispersive contact overcomes the conventional problems of the interdependence of the two contacting fluids while offering substantially more interfacial area than conventional approaches.

Keywords:
Membrane based solvent extraction, non-dispersive solvent extraction, pertraction, emulsified pertraction, dispersive liquid membrane





APPLICATIONS

The Membrane Technology group within the Chemical Resource Beneficiation Focus Area (NWU) has developed and demonstrated the feasibility of MBSX for various metal separations of relevance to the South African hydrometallurgical industry including:

- **the separation of platinum (Pt), palladium (Pd) and rhodium (Rh) and its recovery from secondary resources like spent automotive catalysts,**
- **the removal of hafnium (Hf) from zirconium (Zr) to below 50 ppm for the use of Zr in nuclear reactors as cladding material,**
- **the separation of tantalum (Ta) and niobium (Nb) and**
- **the recovery of acidic pickling solutions by the selective extraction of the base metal contaminants.**

DESIGN PROCEDURE

Pilot data

- **membrane selection**
- **solvent selection**
- **solvent loss**
- **operation mode**
- **mass transfer rate**
- **equilibrium distribution coefficient**
- **hydrodynamic conditions**

Industrial design

- **membrane area**
- **plant configuration**
- **S/F-ratio**
- **purification & concentration**
- **annualised cost**

ADVANTAGES

- **No phase dispersion, i.e. no undesirable emulsions and third-phases;**
- **High interfacial areas that are well controlled and constant;**
- **High concentration factors;**
- **Easy and reliable linear scale-up (0.1 m^3/h to 100 m^3/h);**
- **Reduction in plant-size;**
- **Environmentally friendly (less solvent and solvent loss)**

Emulsion & third-phase formation in conventional SX:

State of development

A proof of concept has been demonstrated on bench scale, while a mobile demonstration unit (pilot scale) is planned subjected to available funding.

Transaction type and partner profile

The preferred transaction is a license agreement with e.g. entrepreneurs and EPC's willing to invest in the further development and commercialization of pertraction.

IP

A PCT patent application (PCT/IB2012/052907 - WO/2012/168915) entitled: "*Method for the selective separation and recovery of metal solutes from solution*" has been filed.

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