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INSTITUT DE RECHERCHE
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Soutenance de thèse de
Amirhossein Mohammadi
Doctorat en génie minéral
Offert en extension en vertu d'une entente avec
Polytechnique Montréal

« Stabilization of arsenic trioxide roaster waste dust in cemented paste backfill »

Le vendredi **22 novembre 2024**
à 8 h 30 au local E-307 du campus
de l'UQAT à Rouyn-Noranda

HUMAINE
>>>> CRÉATIVE
AUDACIEUSE

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2020-2024

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**Programme offert en extension à l'UQAT en vertu d'une entente avec Polytechnique Montréal*

Stabilization of arsenic trioxide roaster waste dust in cemented paste backfill

The Giant Mine in Yellowknife, Canada, operated from 1948 to 2004, processing gold ore and generating about 237,000 tonnes of arsenic trioxide roaster waste (ATRW) and 17 million tonnes of tailings. ATRW, stored underground, is highly toxic and carcinogenic. The "Frozen Block" method was adopted to stabilize the waste by freezing the ground, but climate change poses risks if thawing occurs. To manage ATRW, various technologies were evaluated, and solidification/stabilization methods were explored, particularly the use of cemented paste backfill (CPB), which combines tailings, binders, and water to stabilize hazardous waste.

This study aimed to assess the feasibility of incorporating ATRW dust into CPBs to reduce arsenic leachability. Several binders and mixing ratios were tested using ATRW dust, tailings, and deionized water. The geomechanical and geochemical properties of CPB samples were analyzed, revealing that adding pure arsenic trioxide (As2O3) decreased the mechanical strength of the samples. Cement types such as GU and GU/slag were tested, and samples with As2O3 showed weaker strengths, especially after 96 days of curing.

Further research was conducted using response surface methodology (RSM) to optimize CPB mix designs. Higher binder and solid contents were found to improve the strength of CPB samples. However, adding ATRW reduced the strength by over 30%. Monolithic tank leaching tests revealed that high-strength samples resisted leaching, but arsenic could still be released from the CPBs' surfaces. The study concluded that ATRW incorporation into CPBs requires further modifications to minimize arsenic solubility and surface leaching risks.