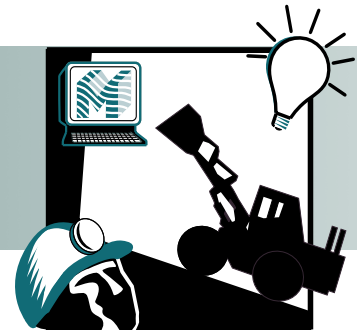


# MINING

## Project Fact Sheet



## SELECTIVE FLOCCULATION OF FINE MINERAL PARTICLES

### BENEFITS

- Decreases energy use per unit of material recovered
- Recovers valuable fines that are currently lost to waste
- Decreases tailings production

### APPLICATION

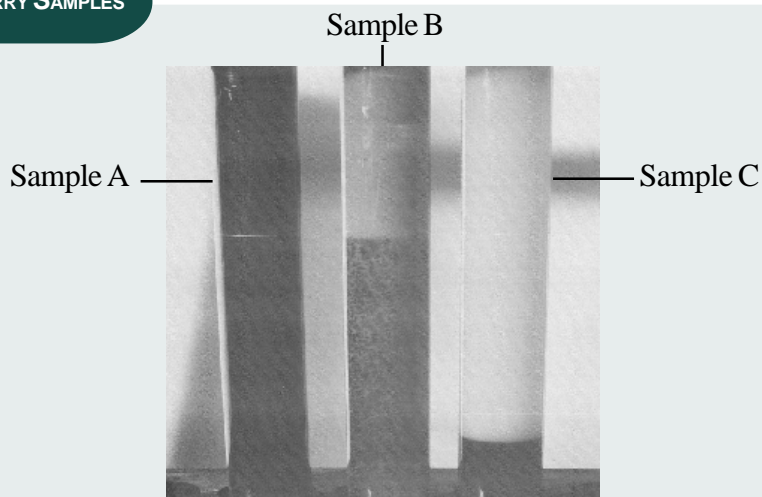
Selective flocculation technology developed in this project could be adapted for use by many separations plants that lose valuable minerals that are too fine to be recovered with other technologies.

## SEPARATION TECHNOLOGY WILL INCREASE RECOVERY OF FINE MINERALS LOST TO WASTE

Selective flocculation will improve fine particle recovery and increase energy efficiency in the minerals processing industry. An additional benefit is a significant decrease in tailings production. Flocculation may be used to separate two or more finely divided minerals in a dilute slurry. Currently, flocculation is used in dewatering and clarification unit operations and a variety of flocculants and methods are available for bulk or nonselective flocculation. Selective flocculation, the flocculation of one mineral constituent from a slurry of several dispersed mineral types, has been used sparingly in industrial practice. Its widespread application has been limited by the difficulty in controlling the parameters that affect selectivity and by high reagent costs.

Successful selective flocculation technology for one mineral system will form the basis for future investigations of process modifications; this will enable transfer of the technology to other mineral systems. Research includes development and improvement of selective flocculation as a beneficiation method for fine phosphate and coal. Reagents, equipment, and procedures are being screened, modified, and designed to take advantage of slurry characteristics that are common to all mineral systems.

### DILUTE SLURRY SAMPLES



Selective flocculation may be used to separate two or more finely divided minerals in a dilute slurry. With appropriate reagents under the right conditions in the dispersed slurry (sample A), one of the constituents flocculates (dark aggregates in the bottom of sample B) and settles or is otherwise separated from the unflocculated constituents that remain in suspension (sample C).



## Project Description

**Objective:** Develop successful selective flocculation technologies that will enable recovery of ultra fine size minerals and coal currently lost in tailings.

The second year of research has focused on reaching grade and recovery targets set by the industrial partners and on optimizing the developed processes. Bench-scale testing concentrated on low-anionicity flocculants of various molecular weights and staged processing to clean the product. Processes have been optimized for bituminous coal and for Western phosphate, and continuous demonstrations are planned before the project ends. Florida phosphate responds positively to selective flocculation, and testing is continuing with the objective of separating clays from the fine phosphate minerals. Automated process control will be a part of the demonstration on Western phosphate.

## Progress and Milestones

This project completed the following activities:

- Phosphate and coal samples were thoroughly characterized in the first year to determine chemistry, mineralogy, size distribution, and surface properties.
- A standard selective flocculation bench-scale test procedure was developed and implemented with three types of materials: bituminous coal, Florida phosphate clays, and Western phosphate processing fines.
- Bench-scale flocculation tests identified good conditions and reagents for concentration of the desired products from all three materials. Flocculants, dispersants, pH conditions, and stirring and settling conditions were evaluated.

This project involves the following activities:

- Continue sampling and bench-scale flocculation tests
- Continue development of process controls for phosphate selective flocculation
- Scale up and demonstrate pilot-scale circuits for coal and Western phosphate
- Present results at Beneficiation of Phosphates III (December, 2001, St. Pete Beach, FL) and 2002 SME Annual Meeting (February, 2002, Phoenix, AZ)



### PROJECT PARTNERS

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