taken against microbial growth is the periodic injection of strong oxidizing agents such as chlorine gas. It may be necessary to find an antimicrobial agent that successfully prevents growth, is inexpensive, environmentally acceptable, and doesn't interfere with the leaching and uranium recovery processes.

Conclusions

Microorganisms can be either a boon or bane to the mining industry. Bacterial leaching has a vital niche in the production of copper and uranium from low-grade ores. Likewise, low-cost energy-conservative techniques for recovery of vagrant inorganic contaminants from industrial wastewater are making increasing use of microbes.

Further investigation will reveal new applications of microorganisms to benefit the uranium industry. The process likely to have the most potential is the bacterial oxidation of ammonium ion remaining in the formation after in-situ leaching with ammonium carbonate solutions.

However, new technologies in uranium mining are evoking problems not previously associated with this industry. Opportunistic microbes are rapidly and uncontrollably proliferating in artificial environments created at the leaching sites and in the uranium recovery and restoration circuits associated with the operations.

Substantial effort is needed to evaluate microbial practices and problems of the mining industry. Evaluations must be comprehensive, including not only the immediate problem or practice, but the basic aspect of the situation. A cooperative effort among many disciplines is needed, for the solutions to the problems are not likely to be uniquely biological.

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Directory of commercial analytical laboratories in New Mexico

Types of analyses

Routine chemical assays include both wet and instrumental methods (depending on preferences of the individual laboratory) and are analyses of major (1-100%) and minor (.01-1%) elements.

Geochemical assays include analyses of trace elements in geological materials (.0001-.01%); these are usually done by instrumental methods.

Fire assay is a method of analysis for gold, silver, and platinum group metals using furnace heat and dry reagents.

Water quality analyses include the chemical and biological analyses of water constituents but do not include trace contaminants.

Rapid whole-rock analysis is the analysis of the major and minor oxides by atomic absorption.

Radiometric assays pertain to the measurement of geologic time by the disintegration rate of radioactive elements.

Radiochemical assays are chemical analyses of radioactive materials.

Commercial listings

Albuchemist, Inc.
715 San Mateo Blvd. NE
Albuquerque, NM 87108
(505) 268-7367
Routine chemical assays on soil, water, gasoline, ore and paint

Albuquerque Assay Laboratory
4115 Silver Ave. SE
Albuquerque, NM 87108
(505) 268-5776
Routine chemical assays on ores
Rapid whole-rock analyses
Mineral examinations
Trace analyses
Geochemical assays
Water-quality analyses
Radiometric assays

Controls for Environmental Pollution, Inc.
P.O. Box 5351—1925 Rosina
Santa Fe, NM 87501
(505) 982-9841
Radiochemical analyses
Biological assays
Trace inorganic and organic contaminants
Water-quality analyses
Pesticide analyses

Core Laboratories, Inc.
3428 Stanford Dr. NE
Albuquerque, NM 87104
(505) 344-0274
Water analyses
Uranium analyses
Base and precious mineral assays
Geochemical assays

Eberline Instrument Corporation
P.O. Box 2108
Santa Fe, NM 87501
(505) 471-3232
Radiation measurements
Radon monitors
Radiochemistry

Silver City Testing Laboratories, Inc.
505 Texas
Silver City, NM 88061
(505) 538-3029
Routine chemical assays on ores
Fire assays
Custom assays

Prices and fees

Most commercial laboratories have three qualities of work: the *routine* or preliminary, which is the lowest priced and is not run in duplicate; a *control,* which is medium priced and generally run in duplicate; and an *umpire,* which is very exact, usually a wet method run in triplicate. The last method is the most costly. In general the higher the price, the better the results.

The New Mexico Bureau of Mines and Mineral Resources neither vouches for nor recommends the commercial laboratories listed herein over any other laboratories. The information was supplied by the individual laboratories. The list is intended to include all laboratories in this area; any omissions are by oversight only. □

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