

(12) **United States Patent**
Geislinger et al.

(10) **Patent No.:** **US 12,346,845 B2**
(45) **Date of Patent:** ***Jul. 1, 2025**

(54) **SYSTEM AND METHOD FOR ACTIVATING DEEP RAFFINATE INJECTION BASED ON COLUMN TEST PREDICTIVE MODEL**

(71) Applicant: **FREEPORT MINERALS CORPORATION**, Phoenix, AZ (US)

(72) Inventors: **Dana Geislinger**, Chandler, AZ (US); **Travis Gaddie**, Phoenix, AZ (US); **Margaret Alden Tinsley**, Titusville, FL (US); **Muneeb Alam**, Alexandria, VA (US); **Steven Chad Richardson**, Thatcher, AZ (US); **Akaash Sanyal**, Boston, MA (US); **Raquel Crossman**, Mesa, AZ (US); **Tianfang Ni**, Boston, MA (US); **Cory A. Demieville**, Scottsdale, AZ (US); **Luke Gerdes**, Framingham, MA (US); **Robyn Freeman**, Menlo Park, CA (US); **Oleksandr Klesov**, Lexington, MA (US); **Luciano Kiniti Issoe**, Sao Paulo (BR)

(73) Assignee: **FREEPORT MINERALS CORPORATION**, Phoenix, AZ (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **18/398,701**

(22) Filed: **Dec. 28, 2023**

(65) **Prior Publication Data**
US 2024/0127135 A1 Apr. 18, 2024

Related U.S. Application Data

(60) Division of application No. 18/339,998, filed on Jun. 22, 2023, now Pat. No. 11,948,103, which is a
(Continued)

(51) **Int. Cl.**
G06Q 10/04 (2023.01)
C22B 3/06 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC **G06Q 10/04** (2013.01); **C22B 3/06** (2013.01); **C22B 15/0067** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC G06Q 10/04; G06Q 10/0631; G06Q 50/02; C22B 3/06; C22B 15/0067; C22B 15/0095; C22B 3/08; C22B 15/0071; Y02P 10/20
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,502,898 A * 4/1996 Manore G01S 17/42 33/290
6,319,389 B1 11/2001 Fountain et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CA 2573936 5/2010
CN 111738945 A * 10/2020 G06N 20/00
(Continued)

OTHER PUBLICATIONS

Bennett, C. R., et al. "A comprehensive model for copper sulphide heap leaching: Part 1 Basic formulation and validation through column test simulation." Hydrometallurgy 127 (2012): 150-161.
(Year: 2012).*

(Continued)

Primary Examiner — Keith D. Hendricks
Assistant Examiner — Moriah S. Smoot
(74) *Attorney, Agent, or Firm* — SNELL & WILMER L.L.P.

(57) **ABSTRACT**

The method may comprise receiving historical data (e.g., mineralogy data, irrigation data, raffinate data, heat data, lift
(Continued)

