Facile, Low-Energy Routes for the Production of Hydrated Calcium and Magnesium Salts from Alkaline Industrial Wastes

Tech ID: 29541 / UC Case 2018-148-0

SUMMARY

UCLA researchers in the Department of Civil and Environment Engineering have developed a method for production of hydrated calcium and magnesium salts from alkaline industrial wastes using a facile and low-energy process.

BACKGROUND

The commercial production of $Ca(OH)_2$ (portlandite) and $Mg(OH)_2$ (brucite) presently involves calcining based methods, which require a significant amount of thermal energy. The production process is relatively complicated, involving high temperature calcination (around 800°C for $Ca(OH)_2$ and 1000 °C for $Mg(OH)_2$).

INNOVATION

UCLA researchers have developed a novel method for $Ca(OH)_2$ and $Mg(OH)_2$ production which can be performed entirely at temperatures below 100°C. The process involves (1) extracting Ca and Mg ions from crystalline and amorphous alkaline solids via leaching and/or dissolution, (2) concentration of Ca and Mg in the leachate via capacitive concentration and reverse osmosis membrane filtration methods, and (3) precipitation of $Ca(OH)_2$ and $Mg(OH)_2$ from solution via low temperature heating. The process utilizes industrial waste streams, including those from metal processing and fuel combustion (e.g., coal ash) as raw materials, as well as waste heat from power plants for precipitation. In addition, the capacitive concentration method may be highly selective to divalent ions, achieving even higher extents of concentration during the process.

APPLICATIONS

- Hydrated calcium and magnesium salt production
- Concentration of divalent ions
- Industrial waste utilization

ADVANTAGES

- Utilization of industrial waste, cost-effective and sustainable
- High concentration yield
- Facile process
- Low energy consumption

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,503,372	12/23/2025	2018-148
United States Of America	Issued Patent	11,560,318	01/24/2023	2018-148

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Method For Mitigation Of Alkali-Silica Reaction In Concrete Using Chemical Additives
- Inorganic Admixtures for Preventing Conversion Phenomena in High-Alumina Cements

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OTHER INFORMATION

KEYWORDS

Ca(OH)2, Mg(OH)2, portlandite, brucite, production, alkaline solids, capacitive concentration, selectivity, industrial waste, leaching, low temperature, concentration

CATEGORIZED AS

- **Energy**
  - Other
- **Materials & Chemicals**
  - Chemicals

RELATED CASES

2018-148-0

- Buffer-Free Process Cycle For Co2 Sequestration And Carbonate Production From Brine Waste Streams With High Salinity
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