Method For Mitigation Of Alkali-Silica Reaction In Concrete Using Chemical Additives

Tech ID: 30163 / UC Case 2017-847-0

SUMMARY

UCLA researchers in the Department of Civil and Environment Engineering have developed a new alkali-silica reaction (ASR) mitigation method using calcium nitrate, which is an abundant, cost-effective alternative to current approaches.

BACKGROUND

The availability of aggregates for concrete that are not prone to deleterious alkali-silica reaction (ASR) is dwindling, requiring either transportation of non-reactive aggregates over long-distances or chemical methods of mitigation. Current strategies to mitigate ASR rely upon replacement of cement with supplementary cementitious materials (e.g., silica-rich coal fly ashes, slag, metakaolin) or use of chemical admixtures containing lithium. However, the efficacy of these materials is highly variable, due to compositional variation, seasonal supply, or high costs in the case of lithium-based additives.

INNOVATION

UCLA researchers have demonstrated the use of calcium nitrate ($Ca(NO_3)_2$) to mitigate ASR in concrete. The calcium salt is added to the concrete by dissolving it into the water that is used to prepare the mixture (i.e., the combination of cement, supplementary cementitious materials, water, and coarse/fine aggregates). It forms non-expansive calcium-rich reaction products at the interface between the potentially reactive aggregates and the cementitious pore solution within the concrete. This prevents further dissolution of the aggregates, offering an abundant, cost-effective method for ASR inhibition.

APPLICATIONS

- ASR inhibition in concrete materials management and transportation

ADVANTAGES

- Abundant ingredients
- Cost-effective
- High efficacy

PATENT STATUS

Country	Type	Number	Dated	Case
Australia	Issued Patent	2018318087	10/10/2024	2017-847
United States Of America	Issued Patent	11,820,710	11/21/2023	2017-847
United States Of America	Issued Patent	11,339,094	05/24/2022	2017-847

Additional Patents Pending

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Inorganic Admixtures for Preventing Conversion Phenomena in High-Alumina Cements
- Buffer-Free Process Cycle For Co2 Sequestration And Carbonate Production From Brine Waste Streams With High Salinity
- Facile, Low-Energy Routes for the Production of Hydrated Calcium and Magnesium Salts from Alkaline Industrial Wastes

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INVENTORS

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OTHER INFORMATION

KEYWORDS

concrete, alkali-silica reaction, chemical additives, mitigation, expansion, calcium, dosing

CATEGORIZED AS

- **Materials & Chemicals**
  - Chemicals

RELATED CASES

2017-847-0

▶ Controlled And Efficient Synthesis Of Inorganic-Organic Composite Cementation Agents With Enhanced Strain Capacity

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