Technical Brief

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Cost effective cyclic process to produce free flowing industrial grade and refined edible NaCl (common salt)

Technology Summary

An inexpensive, recyclable additive to prepare free flow crystals of common salt in bulk at cheaper costs. Two different morphologies of rock salt crystals obtained for the first time with the addition of a single non-toxic additive - alanine. The resulting free flow salt is storage stable and also of desired taste and flavour.

Background

Salt is a basic and essential food commodity, and is also used widely by industry. It is usually manufactured by extracting salt from sea water. Raw salt occurs naturally as white cubic crystals and contains many impurities. It is prone to caking / lumping due to the formation of solid intercrystalline bridges. Various crystal habit modifiers, such as urea, glycine, cadmium chloride, nitrilotriacetic acid, can change the morphology of NaCl and facilitate the free flow of salt. However, many of these modifiers are expensive, and there is a need to find more an inexpensive method for the bulk preparation of pure, free flow salt.

Technology Description

Alanine isomers (α- and β-) were added to a saturated NaCl solution. The solution was stirred at 40 degrees for ~10 min, and then allowed to cool slowly to room temperature and then kept for crystallization. Under these conditions, β-alanine was found to induce rhombic dodecahedron crystals, while α-alanine could yield octahedron crystals. Powder X-ray diffraction studies were performed with the two different crystals to study the morphology.

Applications

Common salt is widely used as a condiment and food preservative. It is commonly used as a basic raw material for a variety of industrial chemicals, like soda ash and caustic soda, including in the textile, dairy, dyeing, fertilizer, paper, and pharmaceutical industries.2

Computational predictions turning the isomers of alanine to generate distinct morphs of free-flowing salt crystals. Mrinal Kanti, Sumit Kumar Pramanik, Vinayak Hingu and Bishwajit Ganguly. Phys. Chem. Chem. Phys., 2018, 20, 17125--17131 | 17129

https://journals.asm.org/doi/10.1128/AEM.02605-19

Value Proposition

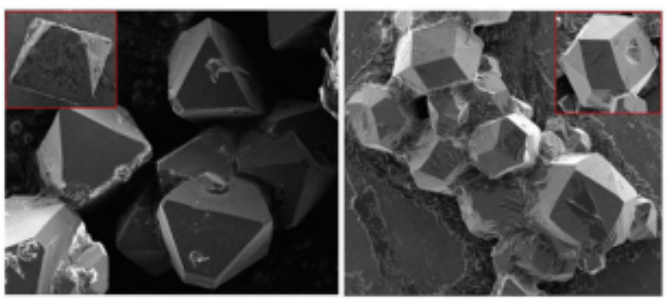
- First report of two different morphologies of rock-salt crystals with two isomers of a single additive. Alanine isomers (**α**- and **β**-) can induce octahedron and rhombic dodecahedron morphologies in salt crystals.
- Storage stable free flow salt
- Non-toxic additive used
- Cost effective
- Inexpensive additives used
- Additives used are recyclable
- Salt is of high quality
- Free of impurities

Market Potential

The global rock salt market is expected to grow at a robust growth over the forecast period i.e. 2017-2024. India is the third largest salt producing country in the world after China and USA with Global annual production being about 230 million tonnes.. The total human consumption of salt in India is about 59 lakh tonnes annually, with the rest about 107 lakh tonnes consumed by industries, according to Tata Chemicals, one of India's corporate salt producers.

Technology Status

- Demonstrated at 5kg scale
- Patent protected
- Seeking interested industry partners



SEM images for the NaCl crystals in the presence of a- and balanine.

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