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Patent Search

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Abstract:

The present invention provides a novel process route for the production of environmentally friendly, cost competitive, mesoporous bio-calcium silicate from renewable bio-sources and sustainable agricultural by-products to substitute materials from synthetic sources to utilize them for high performance applications. For the preparation of bio-based calcium silicate, the precursors namely calcium chloride and sodium silicate were derived from calcium rich precursors (viz., egg-shell and sea-shell) and silica rich source (rice-husk and Mexican grass) respectively through appropriate thermal and chemical experimental methods. The bio-based calcium silicate samples are obtained by gradual addition of sodium silicate to calcium chloride with efficient agitation. The precipitate obtained was washed several times with de-ionized water and dried, and characterized. The samples of different calcium silicate obtained were transformed in to mesoporous bio-calcium silicate at different pH conditions (pH = 2, 4, 6 and 12) using conc.HCl and caustic soda with nonylphenol ether template. The different samples of mesoporous calcium silicate obtained were washed, dried and characterized. The percentage yield of the mesoporous bio-calcium silicate samples obtained from different sources and varying pH (2, 4, 6, 12) conditions are in the ranged between 80% and 85%. It was observed that among the samples of meso-porous bio-calcium silicate obtained from different sources, the meso-porous bio-calcium silicate (PH =2) developed using rice husk ash and egg shell source possesses the highest surface area of 102 g/m² and the lowest particle size < 50 nm.

Complete Specification

I 4. DESCRIPTION

Field of invention

The present invention deals with the production of mesoporous bio-calcium silicate from environmentally friendly, renewable and sustainable agricultural residues possess rich siliceous materials and calcareous bio-mass from natural sources viz., egg-shell and sea-shell. The silica present in rice-husk as well as Mexican grass was converted into sodium silicate through incineration followed by chemical treatment using caustic soda. Similarly, the calcium rich precursors are converted into calcium hydroxide through appropriate process route involving thermal and chemical treatments. Then, the stoichiometric quantities of sodium silicate and calcium chloride are mixed under appropriate experimental conditions with efficient agitation to obtain calcium silicate and subsequently transformed in to mesoporous bio-calcium silicate through facile process route. Then the product was thoroughly washed, dried and characterized for its physico-chemical, morphological and textural properties using appropriate modern analytical methods. The production of mesoporous bio-calcium silicate from bio-mass and agricultural

residue is considered to be a cutting-edge route to utilize sustainable precursor materials to transform value added materials for high performance applications. Background of the invention

Calcium silicate or wollastonite is a mineral consisting of calcium, silicon and oxygen. Its molecular formula can be expressed as CaSiO₃ or CaOSiO₂. Calcium silicate can be used in different industrial sectors such as ceramics, glasses, paints, paper, plastic, electrical insulator and cements. There are several methods to produce calcium silicate such as sol-gel hydrothermal method and solid-state reaction. The conventional route is solid-state reaction and is considered as environmentally friendly method. Mostly

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