UNIVERSITY OF LIMERICK
OLLSCOIL LUIMNIGH

Technology Transfer Office

Licensing Opportunity

Synthesis of Porous Silica Particles for Drug Delivery

Overview

The Invention is a novel method for manufacture of porous silica for the drug delivery market.

Existing methods use harsh inorganic liquid acids for acidification. To obtain better control of precipitation, pH needs to be controlled precisely. For such a precise control of pH, invariably dilute acids need to be used. This generates unnecessary dilute reaction mixture which greatly enhances separation costs and enlarges environmental footprint.

Key problems with the methods known are:

1. Use of inorganic acids – mostly liquids: generates significant waste since dilute acids need to be used to achieve desired control on pH
2. Generate very dilute solid-liquid mixture – causes difficulties in separating solid silica particles from dilute mixtures
3. The acidification reaction is strongly influenced by local meso and micro-scale mixing which is notoriously difficult to control – leading to poorer control on properties of produced silica particles.
4. The process by inherent nature poses difficulties for scale-up

Technology

Scientist at the University of Limerick have developed a room temperature method using atmospheric pressure gaseous CO2 for acidification as well as for removing templating agents.

Benefits include:

1. The acidifying agent is in gaseous form, this enables higher solid loading of desired silica particles.
2. The process uses atmospheric CO_2 at room temperature. The process time scales are significantly lower than current methods.
3. Sparging of gas can be controlled by designing appropriate spargers and gas-liquid contactors. Several intensified gas-liquid contactors (like
4. pinched tube, fluidic oscillators, vortex diodes, helical coils, coiled flow inverters). Ambient pressure and temperature coupled with gaseous reactant greatly enlarge design
5. space and offer numerous optimisation avenues.
6. The rate of addition of CO_2 (mass flow rate), bubble size distribution of CO_2 bubbles (controlled via sparger design) and mixing generated by bubbles (controlled by number and location of spargers) offer a unique and novel way to control acidification.
7. This method allows greater control of particle sizes, porosity and surface properties.
8. Using CO_2 can make the process greener and avoids use of corrosive inorganic acids like hydrochloric acid or sulphuric acid.

Applications:

The intended use for the University of Limerick silica method is **Drug Delivery**. Mesoporous silica is widely used in the research and development (R&D) activities conducted for cancer treatments. Significant growth in the pharmaceutical industry across the globe is one of the key factors creating a positive outlook for the market.

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