26 JUN 2014
ORIGINAL
3106/CHE/2014

NAME OF THE APPLICANT: Venkateswer Rao Mandapati
Venkateswara Rao Sodisetti
Venkatesan K R

No. of Sheets: - 1
Sheet No: - 1

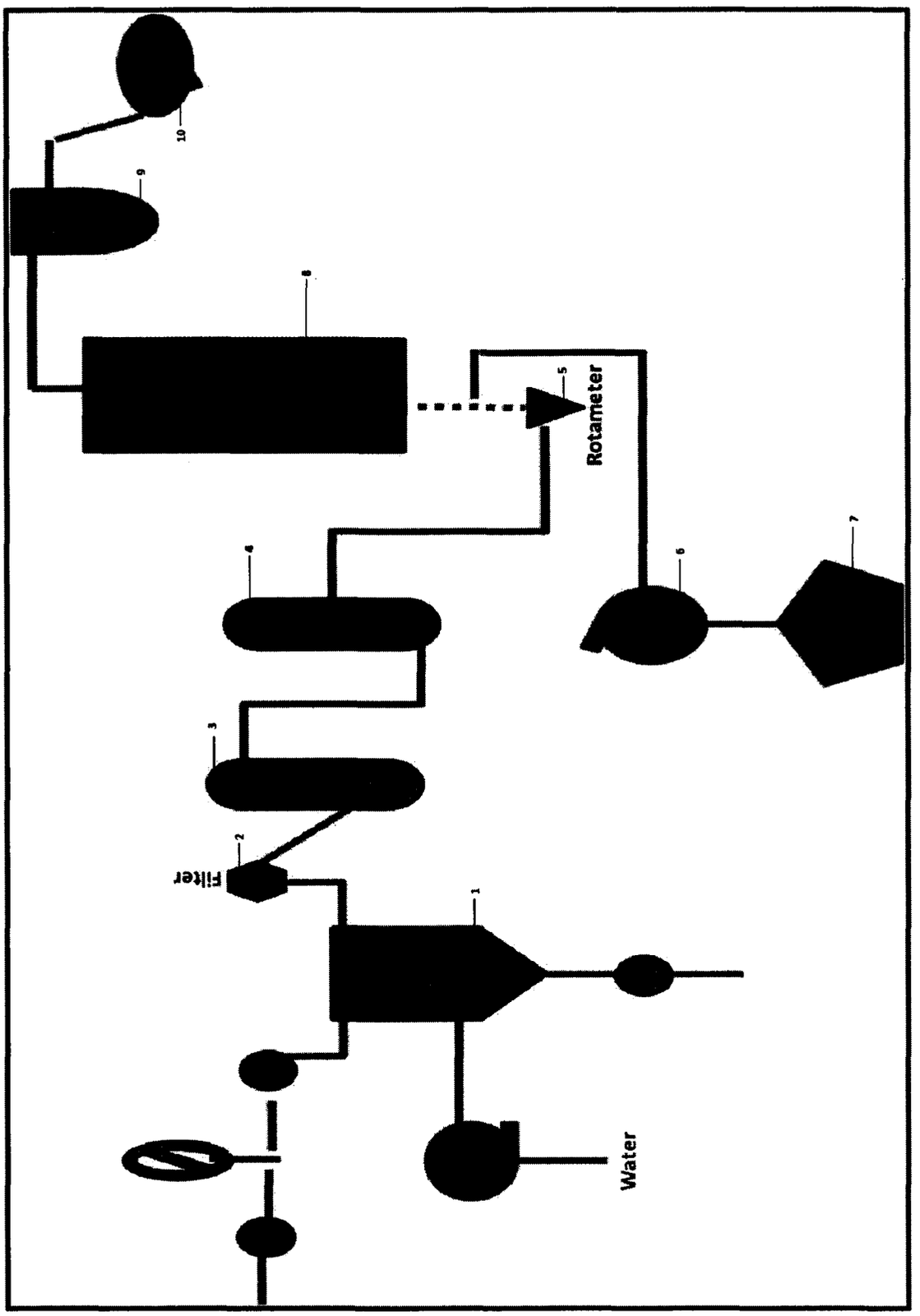

Fig. 1: Schematic representation of Production Of Carbon Nanotubes in Large Scale

SUBHAJIT SAHA
Patent Agent (IN/PA- 1937)
Agent for the applicant

FIELD OF INVENTION

The present invention relates to the synthesis of Carbon Nanotubes (CNTs) from industrial emission. More particularly, the invention relates to a novel process of synthesizing CNTs from industrial emission, using hybrid Chemical Vapor Deposition (CVD) reactor.

BACKGROUND OF INVENTION

Carbon nanomaterials (CNMs) have been discovered in 1991, and since then, it has many exceptional electrical, optical, magnetic and mechanical properties and attractive potential applications. These CNMs can be formed from a wide variety of different materials. Industrial emissions can be considered as one of the most basic and inexpensive materials for the production of carbon nanomaterials.

Till date, a number of methods for the synthesis of CNMs have been reported, which can be grouped into three types: arc discharge (R.H. Baughman, 2002), laser ablation (C. Journet,1997, Z. Shi,2000) and catalytic chemical vapor deposition (CCVD) (M. Zhang, 2001, J. Kong, 1998, D.E. Resasco, 2002). Of these methods, the CCVD method has drawn more attention due to its potential.

Carbon nanomaterials production increases with the addition of metal catalyst to the industrial emissions. Even CNMs synthesis takes place at respective temperatures, a complete decomposition of the catalytic precursor is expected which acts as a nucleation agent to enhance growth of the CNMs.

There are no complete studies about the synthesis of CNMs with industrial emissions as the carbon source in the literature. Our results demonstrate that industrial

emissions may be a good precursor for the production of CNMs by the CCVD method, for which one of the reasons might be due to the mixture of the components such as CH_4, CO and H_2 in industrial emissions that are involved, in one way or another, in the formation process of CNMs.

OBJECT OF THE INVENTION

It is an object of this invention to provide a novel process of synthesizing carbon nanotubes (CNTs) from industrial emissions.

SUMMARY OF INVENTION

The present invention discloses a process of synthesizing carbon nanotubes (CNTs) in large quantities with continuous process by catalytic Chemical Vapour decomposition of industrial emissions as a carbon source.

In one aspect, the present invention employs a novel CVD rector which employs the industrial emission as an input and produces CNTs at a very low cost.

BRIEF DISCRIPTION OF DRAWING

These and other features, aspects, and advantages of the present invention will become better understood, when the following detailed description is read with reference to the accompanying drawings in which like reference numerals represent like parts throughout the several drawings, wherein:

Fig. 1 is a schematic representation of the process used in the present invention

DETAILED DESCRIPTION OF THE INVENTION:

The present invention is directed to a process of continuous production of carbon nanotubes (CNTs).

Referring to Fig. 1 which is a schematic representation for the production of CNTs; the industrially emitted gases (IEG) enters the Tar Separating Chamber **1**, where the volatiles present in the IEG is separated. The residual gas includes some solid particles which is removed with the help of filter **2**.

The gas further enters the Mist Eliminator **3**, which traps the moisture present in the gas. The moisture free gas enters the dryer **4**, in which the gas is dried.

The dried gas enters the Hybrid CVD reactor **8**. The Hybrid CVD reactor **8**, is a specially designed rector in which the CNTs are produced continuously. The CNTs are prepared in a vertical stainless steel tube within the reactor.

It has a two stage furnace system. A catalyst ferrocene is sent into the CVD reactor **8**, using in-situ method in the middle of the first stage furnace, of which the temperature is maintained at 400°C. The precursor chamber **7** produces the ferrocene required in the reactor. A particular flow of dried industrial emission is introduced in the reactor

with the help of a Rotameter **5**. The second stage furnace is ramped at a particular heating rate to the preset reaction temperature and is held at a final temperature of 700°C continuously.

At one end of the hybrid CVD reactor is connected to the blower 10, to suck the CNTs into the Bag Fibre Filter, **9**.

Dated this 19th day of June 2014

Signature

SUBHAJIT SAHA
Patent Agent (IN/PA- 1937)
Agent for the applicant