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A Review Paper on Smoak Absorber Plate from Chemical Analysis of Air Particulate Matter Trapped by a Porous Material, Synthesized from Silica Fume, Sodium Alginate, Calcium Iodate, Sodium Bicarbonate, Ultrapure Deionized Water

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Abstract:- The aim of this paper was the evaluation of hybrid porous materials, Sustainable materials synthesized from by-Products and alginates for Clean air and better Environment, realized with raw materials such as silica fume. Hydrogen peroxide was used as pore former to generate a porosity able to trap particulate matter (PM). These new materials are compared with the reference recently proposed porous SUNSPACE hybrid material, which was obtained in a similar process, by using silica fume. The testing of material was done by testing the concentration of hydrocarbon, carbon dioxide and carbon. The concentration of hydrocarbon and carbon dioxide released was less which proves that the porous material can adsorb hydrocarbon & carbon dioxide release in air. The material prepared was successfully able to reduce the quantity of by-products by trapping the emitted gases and this process of preparing porous material is highly efficient adsorbent to control contamination of air is possible.

Keywords:- *Plastic, porous material, air, absorbent, SUNSPACE, chemicals.*

I. INTRODUCTION

Air pollution is becoming an important issue worldwide. The Presence of solid components in air is referred to particulate Matter (PM) or dust. Silica fume, alginate, as Jellifying agent and sodium bicarbonate, as the pore maker.

Sustainable materials Synthesized from byproducts and alginates for clean air and Better environment material is made with silica fume, Silica fume is made up of amorphous silicon dioxide (85-95%). A porous solid can be obtained by gel casting and heating, at about 70-80°C, a mixture of In this work a new mesoporous adsorbent material obtained from a natural, high Abundant raw material and a high volume industrial by-product is presented. The Material is consolidated by the gelling properties of alginate and by decomposition Of sodium-bicarbonate controlled porosity at low temperatures (70–80◦C) at different Scale lengths. The structural, thermal, and morphological characterization shows that the Material is a mesoporous organicinorganic hybrid. The material is tested as adsorbent, Showing high performances. Methylene blue, used as model pollutant, can be adsorbed And removed from aqueous solutions even at a high concentration with efficiency up to 94%.

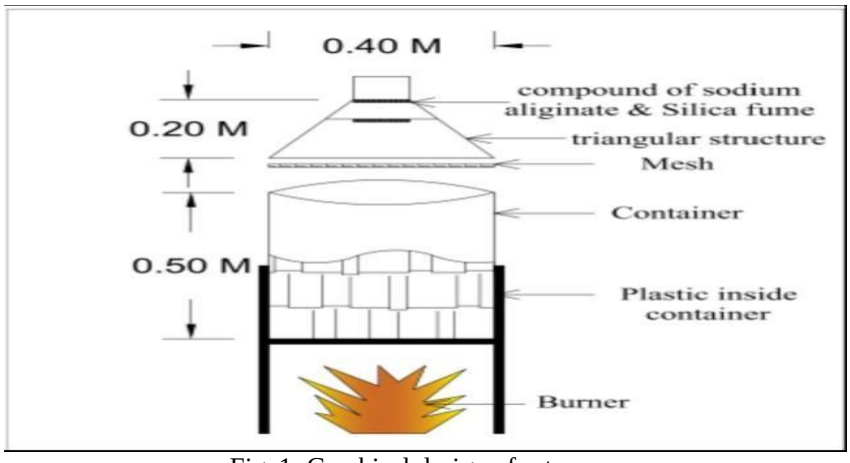

Fig. 1: Graphical design of set-up

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II. MATERIALS AND METHODS

- Calcium iodate
- sodium alginate
- Sodium bicarbonate
- Silica Fume.
- Ultrapure deionized water

III. METHODOLOGY

First the silica slurry was prepared in which 1.2 g sodium alginate (Na2CO3) were dissolved in 50 ml double deionized water at room temperature and mixed till complete dissolution. Afterwards 2 g calcium iodate (Ca(IO3)) was rapidly added to the sodium alginate (Na2CO3) solution under continuous stirring and gel rapidly formed.Then 36.76 g silica fume was added and finally 10 g of sodium bicarbonate (NaHCO3) was thoroughly mixed to the slurry.

The slurry was then put in round molds and warmed on a heating plate at 80◦C for 12 hr. At this temperature the Ca(IO3)2 solubility increased and more rapid release of Ca2+ions fastened the gelation process of SA and the consolidation of the hybrid materials.

Simultaneously sodium bicarbonate thermally decomposed and the consequent release of CO2 induced pore formation. At these conditions porous disks with a thickness and a diameter were obtained.

To remove unreacted components, samples were rinsed with double deionized water and dried at ambient conditions. Whole or crushed porous disks were used for further characterization.

IV. PROPERTIES

A. Calcium iodate:-

Calcium iodate are inorganic compound composed of calcium and iodate anion. Two Forms are known, anhydrous Ca(IO3)2 and the hexahydrateCa(IO3)2(H2O). Both are Colorless salts that occur naturally as the minerals called lautarite and bruggenite,respectively. A third mineral form of calcium iodate is dietzeite, a salt chromate with the formula Ca2(IO3)2CrO4.It is insoluble in water, soluble in common solvents. Iodine is required in small amounts in human body for the function of the thyroid gland. Iodine forms many important compounds of iodine such as iodineoxide, potassium iodide, iodine trichloride and iodoform of an Iodine containing organic compound.

Fig. 2: Calcium iodate

B. Sodium Alginate:-

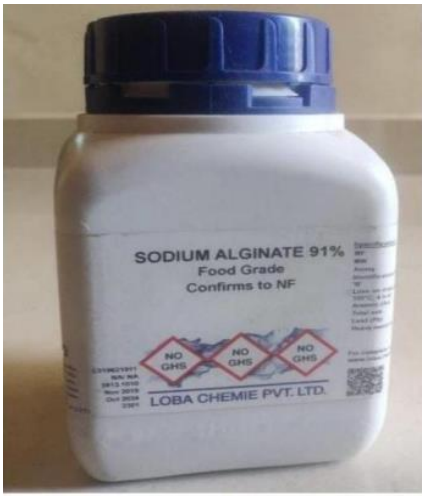

Fig. 3: Sodium Alginate

Sodium alginate (NaC6H7O6) is a linear polysaccharide derivative of alginic acid Comprised of 1, 4-β-mannuronic (M) and αl-guluronic (G) acids. Sodium alginate is a Cell wall component of marine brown algae, and contains approximately 30 to 60% Alginic acid. The conversion of alginic acid to sodium alginate allows its solubility in Water, which assists its extraction. Bacterial alginates are synthesized by only two Bacterial genera, Pseudomonas and Azotobacter, and is used for protection from the Environment and the synthesis of biofilms in order to adhere to surfaces. This method of Synthesis allows the bacteria to produce alginates with a well-defined monomer Composition, which may allow the production of “tailor-made” bacterial alginates (Hay etal., 2010).

C. Sodium bicarbonate

Fig. 4: Sodium Bicarbonate

Sodium bicarbonate (IUPAC name: sodium hydrogen carbonate), commonly known as Baking soda, is a chemical compound with the formula NaHCO3. It is a salt composed of A sodium cation (Na+) and a bicarbonate anion (HCO3−). Sodium bicarbonate is a white Solid that is crystalline, but often appears as a fine powder. It has a slightly salty, alkaline Taste resembling that of washing soda (sodium carbonate). The natural mineral form is Nahcolite. It is a component of the mineral natron and is found dissolved in many mineral Springs.

D. Silica Fumes

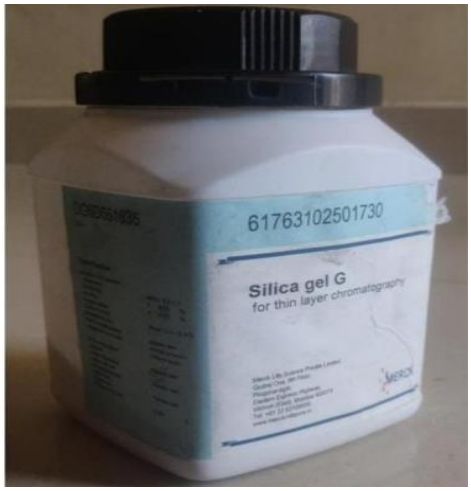

Fig. 5: Silica Fumes

Silica fumes are also known as microsilica is an amorphous polymorph of Silica dioxide, silica. It is an ultrafine powder collected as by-product of the Silicon and ferrosilicon alloy production and consisit of spherical particles With an average particle diameter of 150nm. The main field of is as Pozzolonoc material for high performance concrete.It is sometimes confused with fumed silica However, the production process, Particle characterastics and fields of application.

V. CONCLUSIONS

The aim of this study is to evaluate the ability of a new sustainable porous material, called SUNSPACE, to entrap air PM. The preparation procedure is based on environmentally Friendly gel-casting procedure, starting from a mixture of Industrial by-products, including silica fume and sodium Alginate, to obtain a porous solid, whose ability to entrap Carbon-based PM is already demonstrated.

REFERENCES

[1.] B. Srimuruganandam and S. M. Shiva Nagendra, “Analysis And interpretation of particulate matter – PM10, PM2.5 and PM1 emissions from the heterogeneous traffic near an urban Roadway,” Atmospheric Pollution Research, vol. 1, no. 3,pp. 184– 194, 2010.

[2.] N. Kantová, M. Holubčík, J. Jandačka, and A. Čaja, “Comparison of particulate matters properties from combustion Of wood biomass and brown coal,” Procedia Engineering, Vol. 192, pp. 416–420, 2017.

[3.] T. Nussbaumer, “Aerosols from biomass combustion,” IEA Bioenergy Task, vol. 32, 2017.

[4.] A. T. Zosima, L. A. V. Tsakanika, and M. T. Ochsenkühn- Petropoulou, “Particulate matter emissions, and metals and Toxic elements in airborne particulates emitted from biomass combustion: the importance of biomass type and combustion conditions,” Journal of Environmental Science and Health Part A, vol. 52, no. 6, pp. 497–506, 2017.

[5.] I. Araújo, D. Costa, and R. de Moraes, “Identification and Characterization of particulate matter concentrations at construction jobsites,” Sustainability, vol. 6, no. 11, pp. 7666–7688, 2014.

[6.] C. Chow, J. G. Watson, J. L. Mauderlyetal.,“Health effects of Fine particulate air pollution: lines that connect,” Journal of the Air & Waste Management Association, vol. 56, no. 10,pp. 1368–1380, 2012.

[7.] Borgese, M. Salmistraro, A. Gianoncelli et al., “Airborne Particulate matter (PM) filter analysis and modeling by total Reflection X-ray fluorescence (TXRF) and X-ray standing wave (XSW),” Talanta, vol. 89, pp. 99–104, 2012. [8] F. J. Kelly and J. C. Fussell, “Size, source and chemical composition as determinants of toxicity attributable to ambient Particulate matter,” Atmospheric Environment, vol. 60, pp. 504–526, 2012.

[8.] B. J. Christensen, T. O. Mason, and H. M. Jennings. “Influence of silica fume on the early hydration of portland cements usingimpedance spectroscopy,” Journal of the American CeramicSociety, vol. 75, no. 4, pp. 939–945, 1992.

[9.] Mazloom, A. A. Ramezanianpour, and J. J. Brooks. “Effect of silica fume on mechanical properties of highstrengthconcrete,” Cement and Concrete Composites, vol. 26, no. 4,pp. 347–357, 2004.

[10.] Zanoletti, I. Vassura, E. Venturini et al. “A new poroushybridial derived from silica fume and alginate for sustainable pollutants reduction,” Frontiers in Chemistry, vol. 6,no. 60, 2018.