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Preparation Of Ink From Carbon Exhaust

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Abstract: In our day to day life we are facing lots of social problems. We have to find the solutions against the problems. The problems we are facing is like shortage of water, shortage of land for living, More electricity consumption, Lots of unnecessary fuel consumption, because of unnecessary fuel consumption the toxic gases are realised in the air. Gases like nitrogen, carbon, carbon monoxide, carbon dioxide, etc. These gases causes air pollution and oxygen decreases from air. Because of this air pollution human health are affecting very badly it causes Harmon changes, breathing problem, cancer, etc. So our group decided to make a setup of preparation of ink from carbon exhaust. We choose the carbon for ink preparation because in environment the percentage of carbon is increasing, the main reason of increase in the percentage of carbon is unnecessary use of the vehicle and it the biggest social issue so our team has going to build the setup to use carbon as a use full component. In this project we are going to make a device that should collect the polluted air from the atmosphere and filter the air give out the fresh air. While filtering the air carbon will separate from the air and fresh air will give to the environment. The carbon will collected in the filter. Further we will remove the collected carbon soot away from the filter to the separate container and further we will process on it. We will add some chemical like glycerine, oil and alcohol, and other homogeneous solvent to it to get a fine ink used for writing, painting, printing, etc. after mixing the solvents we keep it fir 1-2 hours in room temp to get well mixed.

I. INTRODUCTION

The carbon soot is formed as a consequence of incomplete combustion of hydrocarbons and organic matter. It causes respiratory diseases like lung cancer and asthma and contributes to 1.6 million premature deaths every year. The primary source of soot is the industry emissions which can be controlled using a simple set which we are going to made. In the present study, various additives were added to the collected soot, forming a homogenous adhering suspension which can be used as an ink. Tests proved that this ink is safe to use and it also complied with the standards of the Indian Government for fountain pen ink. The ink had excellent water-resistant properties as a result of its Rf (retention factor) value was found to be 0.0133. When compared with. conventional black inks, the ink dries quickly, and on varying the temperature of the surroundings from − 30 to 50 °C, the ink. remained in the writable viscosity range of 4.6 to 4.9 mPa s, thus making it universally malleable. The ink also proved to be UV . resistant and neither exhibited feathering, show-through, bleeding nor shading. The ink is versatile; it can be used for a wide range of applications including writing, painting, and spraying. Air pollution refers to the release of harmful gases, particulates, and biological molecules into the atmosphere that is detrimental to the health of the human beings and also to the metabolism of all other biotic components on earth. The pollutants chiefly responsible for causing air pollution are carbon dioxide (CO), sulphur oxides (SO), nitrous oxides (NO), and particulate matter (PM). According to a recent study at Stanford University, particulate matter or carbon

II. OBJECTIVES

- The primary aim of this Project is to design a setup to collect carbon soot. Which we are going to use as a raw material.
- To develop a homogenous mixture proper ink production.
- Try to minimize the size of the setup to reduce the initial cost.
- Using proper amount of required chemical causes effective ink.

III. LITERATURE REVIEW

1. Anush VenkataramanGeorgia Institute of Technology

Effective methods for the safe disposal and recycling of all the by-products generated from different steps were discussed. The proposed scheme was successfully able to decolourize and detoxify both the tannery and textile dyeing effluent with over 90% removal of both COD and BOD. The impacts of the treatment scheme on 14 different effluent parameters were reported.

2. Sakthi Balan, Sairam, Sujith Surya, M.Sundaram, C.Sundaram

Now a day, diesel vehicles emit lot of carbon soot particles to the environment and it affects the respiratory system of humans. By inhaling these carbon soot particle, it will cause asthma, wheezing, lung cancer, etc. There is no proper disposal for the carbon soot particle so, we decide to collect these carbon soot particle by using the filter. These carbon soot particle used to produce the aqueous ink, shoe polish and analyze its property to compare it with the original property.

3. Georgia Ferrari, Paolo Zannini.

First thermal data show that the major part of inks start to evaporate, between 170 and 285 °C, then volatile compounds decompose with exothermic reactions, between 200 and 315 °C, depending on the nature of vehicles and heating rate. Differences in the intensity of phenomena are clearly visible between slow and fast heating rates, suggesting a predominance of combustion over evaporation at fast heating rates. Further studies are necessary to clarify the competition between evaporation and combustion phenomena.

4. Dirgha Joshi, Nisha Adhikari.

Organic solvents are known as carbon-based solvents and their general property is primarily based on their volatility, boiling point, the molecular weight and color. Having enormous hazards associated with the organic solvents, they are used for millions of purposes which alert us to think more on its toxicity points. Almost all of the solvents are hazardous to health, if swallowed or inhaled more than the limit quantity and on contact to the skin most of them cause irritation. Some of the common solvents are acetone, ethyl acetate, hexane, heptane, dichloromethane, methanol, ethanol, tetrahydrofuran, acetonitrile, dimethylformamide, toluene, dimethyl sulfoxide etc.

5. WHO.

This report presents a summary of methods and results of the latest WHO global assessment of ambient air pollution exposure and the resulting burden of disease. Air pollution has become a growing concern in the past few years, with an increasing number of acute air pollution episodes in many cities worldwide. As a result, data on air quality is becoming increasingly available and the science underlying the related health impacts is also evolving rapidly.

6. . Swastika Thakur, Shruti Sindhi.

Unburned carbon particles from industries, chimneys are more than just smelly and unsightly. They can adversely affect health leading to shortness of breath, asthma, stroke, cancer, heart attack, bronchitis and premature death. With time, technology has proved that stuffs which can't be touched can also be recycled and repurposed in the form of ink. It is an expansion of technology to make an eco-friendly environment. This evolved idea fuses science, technology and art. There is a rich carbonaceous content in the polluted air due to burning of fossil fuels. The proposed device is designed as a smart and clever combination of electronic sensors, collection system and mechanical actuators.

7. Varma RS.

Cleavage reactions are expedited by MW exposure of protected molecules on mineral oxides or benign"doped" reagents, as has been shown in the regeneration of alcohols, acids, and carbonyl compounds[12–15].Among several expeditious chemical transformations that can be accomplished under these sol-vent-free conditions, the conversion of carbonyl compounds to the corresponding thio analogs is espe-cially useful. The usual synthesis of thioketones involves the reaction of substrates with hydrogen sul-fide in the presence of acid, phosphorous pentasulfide under basic conditions, or Lawesson's reagent.Using our approach, the carbonyl compounds are simply admixed with neat Lawesson's reagent (0.5 equiv.)

IV. PROCESS METHODOLOGY

The steps involved in the preparation of ink from the carbon soot are illustrated in Fig. 2 and are described as follows: Contraption of soot The "carbon soot collector" is a handy device that collects the carbon soot by filtering the exhaust gases. It is a contraption device that is retrofitted on the exhaust of automobiles. The retro-fitment is connected at the tail section of exhaust with a clamp fitting. The device is designed in such a way that the efficiency of the engine is not affected and also effectively collects the carbon soot (Khatavkar et al. 2019). Purification The collected carbon soot was found to contain toxic impurities like the volatile organic compounds (VOCs), which proves to be fatal to the liver and central nervous system (Mølhave et al. 1993)., The VOCs were removed by heating the obtained samples to 200 °C in a muffle furnace for about 10 min which ensures that most of the volatile components have vaporized (USEPA 2017). The soot was then admixed with 100 mL of distilled water and later boiled at 100 °C. Filtration and drying This admixture was then filtered using the Whatman filter (602 h) paper using a vacuum pump (General Electrics Life sciences 2019). The speed of filtration was found to occur at 150 Herzberg without the pump. The soot was desiccated in the desiccator for 30 min. Mixing and homogenization The soot obtained after drying was dispersed in a suitable solvent, in this case di-methyl formamide (DMF) to form a black, adhering suspension (Coleman 2009; Liu et al. 1999).

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Optimization of the sootto solvent ratio revealed that about 100 mg of soot required about 5 mL of solvent to form 10 mL of ink along with other additives. The ink was homogenized in the Biologics 150VT ultrasonic homogenizer at a frequency of 20 kHz for 45 min (Poonam 2014). The shock waves created as a result of the intense sonic pressure helped in dispersion of the soot particles, as forced dispersion was necessary for stable dispersion of the soot in DMF. Homogenization also de agglomerated the aggregates of soot particles formed due to the very high surface energies (Pan et al. 2015). The de-agglomerated particles were dispersed uniformly in the dispersed medium. Property enhancement Calcium carbonate was used as a thickener to regulate the viscosity of the ink which is supposed to be in the writable range. The use of calcium carbonate as a thickener reduced the cost of the ink and also reduced the use of solvent. The ratio of carbon soot to thickener mass was varied to get the best results for flow and smoothness of the ink, which is discussed in detail in the "Optimization of soot

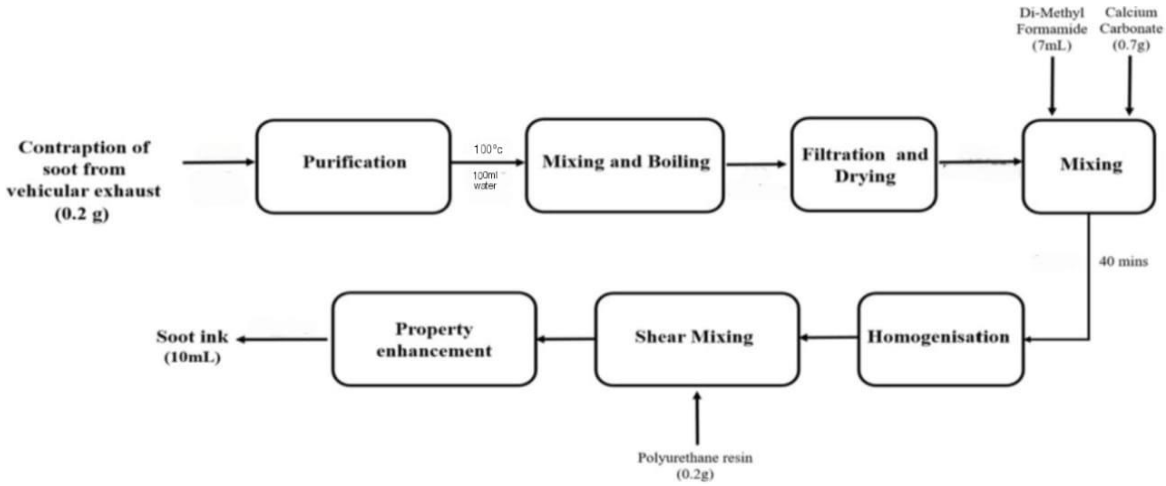
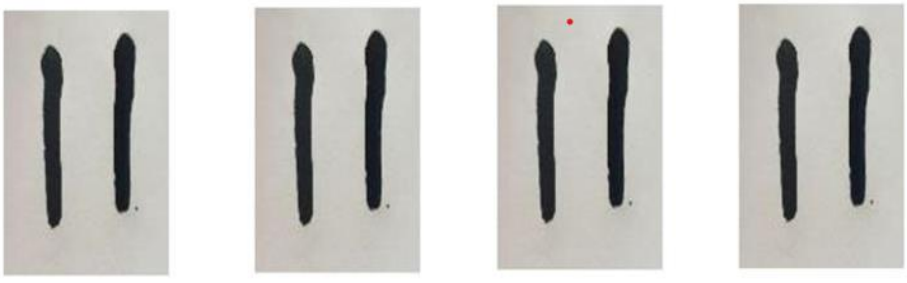


Fig.01 Process Methodology

Optimization of soot-to-solvent and soot-to-thickener ratio with viscosity

Viscosity is the most important property of an ink as it characterizes the effectiveness in the transfer of the ink onto the substrate. Qualitative analysis was conducted in accordance with the said procedures in the Indian Standard IS 1221: 1991, to determine the writable viscosity range of fountain pen inks. It was found that the viscosities in the range of 4.6 to 4.9 mPa s had a better flow and when compared with other viscosity ranges when written on a paper of 1 Cobb test value. The viscosities of the commercially available black inks were also found to be on this range (Anton Parr 2020). Thus, the carbon soot-to-solvent ratio was varied to obtain viscosity in the above mentioned range. It was found that for production of 10 mL of the ink, 100 mg of soot about 7 mL of di-methyl formamide was required to obtain the viscosity in the desired range of 4.6 to 4.9 mPa s. The trends of viscosity obtained for various soot-to solvent ratios are depicted in Fig. 3a. The volume of solvent used was optimized to reduce the cost and to reduce consumption of solvent. It was observed that with increase in the soot-to solvent ratio, the viscosity of the ink increased, as in Fig. 3a. Hence, a thickener was added to regulate the viscosity of the ink. Calcium carbonate was chosen as the thickener due to its ease of availability and lower cost. The thickener mass was varied with a constant carbon soot mass of 0.2 g, and the variation in the viscosity was studied. The variation of viscosity with thickener mass is depicted in Table 1. It was found that the addition of calcium carbonate as thickener did not alter the properties of the ink and also did not affect its colour. For imparting sheen and enhancing the adhesion property of the ink with the paper, polyurethane resin was added. Addition of polyurethane resin was pintsized and this addition did not affect the ink's viscosity. The trends of viscosity variation with resin mass and solvent volume are depicted.



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V. CAD DESIGN

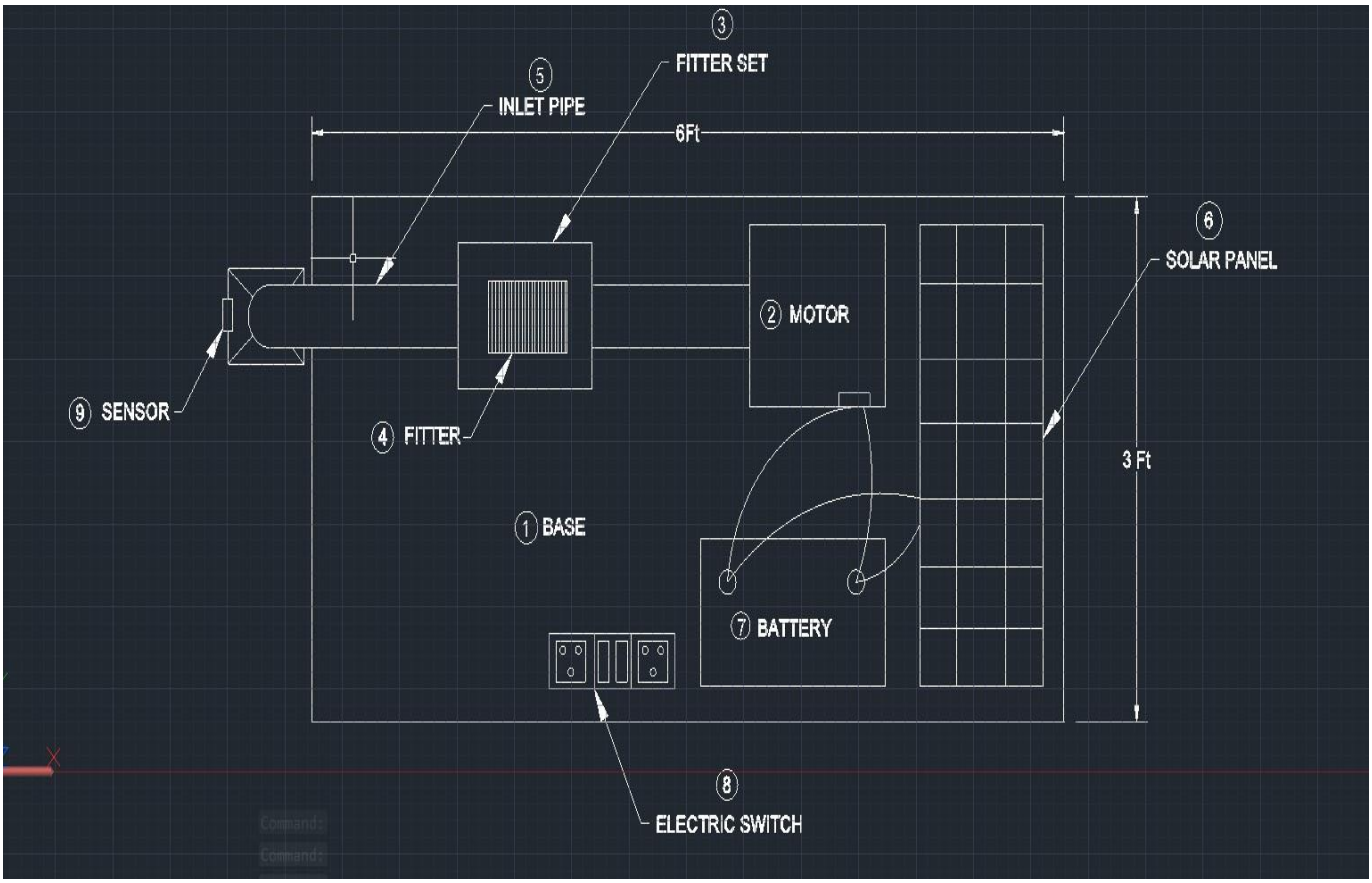

Fig.02. CAD Design

VI. FUTURE SCOPE

- In future we can control the air pollution with the help of this set up. This setup of collecting carbon is very useful in future because we can minimize the percentage of toxic gases release from the factories.
- We can fix the auto sensor to this setup to detect the amount of soot is collected in the filter. Then with the help of robotics and automation field we can fix the auto sensor working hand to remove the collected soot from the filter.
- With the reference of this set up we can make the small set up for vehicles to minimize the air pollution.
- The set up will fixed at the end of the silencer of the vehicles to absorb the carbon which is emits from the combustion.

VII. CONCLUSION

- Now days air pollution is major problem, air pollution is injuries to it causes asthma, wheezing, lung cancer.
- Now a day, diesel vehicles emit lot of carbon soot particles to the environment and it affects the respiratory system of humans.
- We made the setup of recycling the the carbon exhaust into usefull ink. The ink we had made is ecofriendly and not injurious to health.
- The ink we had made is used in printing, shoes polishing, writing, painting.
- This report presents a summary of methods and results of the latest WHO global assessment of ambient air pollution exposure and the resulting burden of disease.
- Ink start to evaporate, between 170 and 285 °C, then volatile compounds decompose with exothermic reactions, between 200 and 315 °C, depending on the nature of vehicles and heating rate.

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