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Surface roughness testing of soot sample

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Abstract - *In this paper a simple, economical, and quick method for the development of soot components from candle soot has been reported. Rough surfaces usually wear more rapidly than smooth surfaces. Roughness is a responsible predictor of mechanical part performance, as irregularities tend to form nucleation sites for breaks or corrosion. The purpose behind this work is to develop model for the evaluation of surface roughness of soot component. In order to get different surface roughness P220 grit surface roughness tester was used. The parameters of surface roughness Ra, Rz and Rmax were measured in three dimensions. Comparison is made by experimenting the same sample for different point. This work is focused on the impact of species characteristics on the surface roughness by using "the direct contact method" which is based on a mechanical system of measurement.*

Key Words: *Soot, surface roughness tester, Ra, Rz, Rmax value.*

1.INTRODUCTION

Soot is a black particle formed when, an oil lamp was lit and a plate was placed on it at regular intervals. Then the black particles stick to the plate, these black particles known as soot.

Soot is formed when oil, natural gas, and wood are burned. It is formed in two places. 1. Industrial, for ex-power plant boilers, central steam-heat boilers, furnaces. 2. Domestic, for ex- house fire, wood, candle, lamp. Soot is widely produced in industrial areas. Elements present in combustion of soot are, carbon 68.87%, oxygen 15.53%, chlorine 2.08%, chromium 0.94%, manganese 0.56%, iron 7.68%, nickel 0.48%, copper 3.87% [1].

Advantages of soot are, it is bad conductor of heat and electricity. It don't have costly repair, maintenance or operational costs. Disadvantages are, if soot particles get into the lungs, they can cause lung disease. Air pollute due to the industrial soot.

Several procedure was used to collect the soot. To get the soot particles, oil lamp was used. To getting the burn to the burn to the lamp, cotton wool was used in the lamp. Plate was used in the lamp. Plate was placed on the regular intervals for collecting black particles of soot. Plate was placed on the regular intervals for collecting black particles. After sometime, black particles accumulated on the plate. Particles which stuck to the plate were collected. Water and fevicol were added to the collected soot particles.

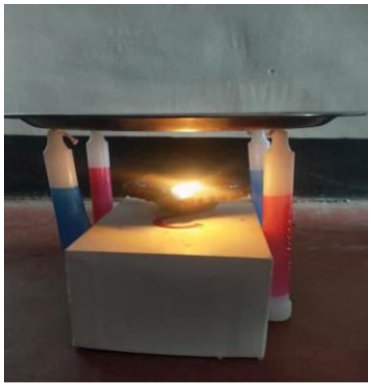

Fig.no.1.1

(Collecting the soot using traditional method.)

After mixing water and fevicol into soot particles, then it become homogeneous mixture. Then that homogeneous mixture was placed into the hydraulic press machine and gives square shape. Then that soot sample look like this

Fig.no.1.2.
(Soot sample)

In metrology lab roughness test done on the soot sample by using SJ-210 roughness tester. From this the values of R, Ra and Rmax values were obtained and graph was obtained.

2. LITERATURE SURVEY

Candle soot, traditionally considered as an unwanted source of air-pollution, has slowly been phased out by modern lighting techniques. However, a 2007 study by Liu and co-workers first brought to light the presence of fluorescent carbon nanoparticles (CNPs) in untreated candle-soot (CS)[2].

The introduction by candle soot. Candle soot is fine black powder carbon like structure. candle materials burn inefficiently, it is because combustion is incomplete. The resulting black soot is hydrocarbon based. soot is released into the air of a building, it eventually deposits onto surfaces because of random collisions between particles.[3] Candle Soot is a product of the incomplete combustion of a candle's hydrocarbon rich fuel the wax. Soot consists of microscopic, often oily, solid particles which are released into the atmosphere as the candle burns. It is the soot particles in the candle flame which give it the characteristic yellow glow[4]. Glass flame slides (7.5 × 2.5 cm) and indium tin oxides (ITO) (1.5 × 2.5 cm2) are cleaned. A glass slide is held on the flame of a candle for 2 hours until a CS layer is deposited. Then, gathering approximately 200 mg the soot from glass slide. Highly stable homogeneous dispersions of the CS are prepared by simply mixing 20 mg CS in 200 mL Fevicoal l and water solution (the ratio is 1:1). Next we mixed the homogenous mixture of soot sample and solution. Then we put in rectangular die and press the hydraulic press machine. After pressing then we remove the material and put to dry the soot material. Waiting from the drying the soot component. After drying the polishing the surfaces of the components by polish paper.

Then we tested the surface by using surface tester SJ210, Ra, Rz and Rmax were measured in three directions. And also tested hardness of the component. After completing this process the graph will be generated. Soot is microscopic hard amorphous carbon particles, the concentration of which can be as high as 8% in automotive lubricants . As elemental particles, soot presents as small but hard spherical particles of 10-35 nm however, they can aggregate into secondary particles which are 'soft' and 'slippery' due to their agglomerated structure with average size of 120 nm or more than 400 nm. Soot clusters can build up to thousands of spherules in size.

Soot sample produces is testing handedness tester is measured. check reading in sample differential location and differential point shows reading. High and lower point reading produce tables. Surface roughness testing by soot sample is tester SJ210 in measurement Ra, Rz(depth), Rmax show table reading and graph. Differential sample reading at different locations points. Surface roughness tester checks surface texture and surface roughness material. the reading is micrometer unit.

3. PROBLEM STATEMENT

Soot is harmful by product of incomplete combustion which creates pollution in environment. To reduce such a pollution, soot can be used in many beneficial ways. Hence soot is collected by using the traditional method and a sample is developed by using specific addition material and then it is tested for different properties.

4. OBJECTIVES

[1] To develop soot sample by using the soot collected form tradition method.

[2]To study the surface roughness of the soot sample by using surface roughness teste.
To reduce pollution created by soot particles.

5.EXPERIMENTATION

The Soot black carbonaceous substance produced during incomplete combustion coal, wood, and oil etc, rushing in fine particles in adhering to the sides of the chimney (A pipe conveying the smoke) e.g also conveyed in the atmosphere to other locations.

1) Collect the soot particles for the experiment and the mixture of water and bond for the soot particles bonding.
2) We used the hydraulic press machine to press the mixture of soot particles to reduce the size and proper bonding.
3) Used hydraulic press machine to create a cube like structure.
4) After making soot particles cube we used the (Mitutoyo 178-561-02A Surface test SJ-210) surface roughness tester machine to check the surface of soot particle cube.
5) We used the Engineering metrology lab for checking the finishing the soot particles cube sample in room temperature.
6) It is the information and Experimentation of the project, which is used in project of surface roughness testing of soot sample and wood sample project.
7) This experimentation is for producing the soot particles samples for better finishing of material.

6.METHODOLOGY

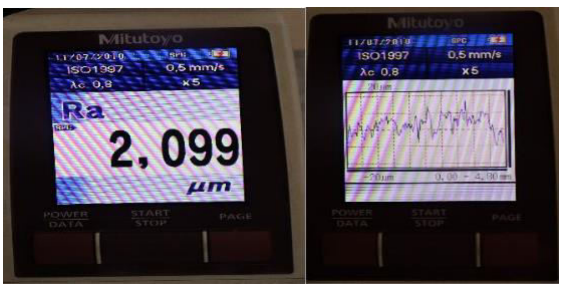

Fig- 6.1
(Roughness testing reading and graph)

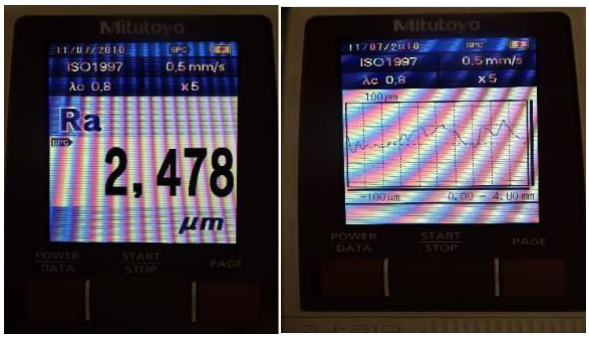

Fig -6.2
(Roughness testing reading and graph)

Glass slides (7.5 × 2.5 cm_2) and indium tin oxides (ITO) (1.5 × 2.5 cm_2) are cleaned. A glass slide is held on the flame of a candle for 2 hours until a CS layer is deposited, as showed in figure 6.1. Then, gathering approximately 200mg the soot from glass slide in figure 6.2. Highly stable homogeneous dispersions of the CS are prepared by simply mixing 20mg CS in200ml. Fevicol and water solution (the ratio is 1:1). Next we mixed the homogenous mixture of soot and solution.

Then we put in rectangular die and press the hydraulic press machine. After pressing then we remove the material and put to dry the soot material. Waiting from the drying the soot components by polish paper.

We have used surface tester SJ210 to measure roughness Ra, Rz, and Rmax value in three direction. Digital hardness tester have used to measure hardness of matrial.

7.FUTURE SCOPE

- Soot is harmful by product of combustion, it can be used as a pigment for inks and dyes. Soot is used in vulcanization process to treat rubber and is used toners for laser printers and copiers. Soot is harmful product hence it should be recycled or minimized.

- To recycle soot particles was compacted using hydraulic press machine and tested for mechanical properties, by using methodology adopted for project, different soot components varying materials, thickness can be produced and tested for mechanical properties in order to use it in different applications like ink and dyes to reduce the pollution

- Hardness can be tested for such samples for various applications.

8.CONCLUSION

Mechanical properties of soot component are reported from laboratory test. The binding material (adhesive) was added 5 to 10% in soot particles. To study compaction characteristics soot components were prepared by using hydraulic press machine. Dimensions of soot components were 6 × 6 × 4 cm.

The following are the conclusions that can be drawn from project work:

Surface roughness of soot component varies within range of 2.09 to 9.20 µm.

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