SURFACE MODIFICATION OF Sio_2 NANO PARTICLES BY ATMOSPHERIC PLASMA TREATMENTS

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Abstract: Silicon dioxide (SiO2) is the most copious mineral on the planet. Plants are the premise of this mineral. In ongoing periods, with the advancement of nanotechnology, silica nano particles have been set up new applications in solar cell. Rice husk and straw are rich reasons for silica.In this investigation, indistinct silica nano particles were produced using RH by substance decrease technique, and the outside of the material is improved by utilizing DC glow discharge plasma. The orchestrated examples were portrayed by XRD,TG/DTA, IV, photoconductivity , photoluminuscence and the consequences of both plasma treated and untreated examples were analyzed.

Keywords:Sio2 ,Rice husk ,rice husk, dielectric, mineral, surface morphology.

INTRODUCTION

Rice husks (or rice hulls) are the rigid shielding of grains of rice. Rice husk is an agricultural residue profusely available in rice manufacturing countries. Husk Formed is around20% of total rice production. Rice husk is usually not recommended as cattle feed meanwhile its cellulose and other sugar contents are very low, it is a partial source of energy for body. Furfural and rice brand oil are removed from rice husk. Industries use rice husk as fuel in boilers and other power production. Among the different types of biomass used for coal gas, rice husk has a high ash content fluctuating from 18 – 20 % and Silica is the major basic of rice husk ash[1].

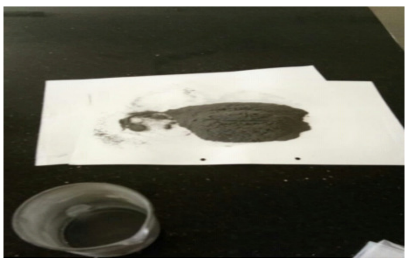
Rice Research Institute of Iran conveyed that the annual paddy production in Iran reaches 3 million tons containing of 65% white rice, 20% husk and 15% bran. SiO2 is obtainable in two forms amorphous and crystalline. A number of products colloidal silica, highly-pure silica and silica gel can be acquired by processing silica. These applications coatings, rubbers, electronics, and optics,. At the same time, it is extensively used in synthesis of chemicals like sodium silicate, highly-pure silicon, silicon nitride, and silicon carbide. High-tech industries are needing silica nano particles, driven by their unique properties (Kalapathy et al., 2000).

Amorphous Sio2

Two models exist to characterize the construction of formless SiO2,the persistent irregular organization model recommended by Zachariasen and the microcrystalline model of Randall. In this first model,the neighborhood primary unit (SiO4 tetrahedron)remains unaltered, with every tetrahedron corner isolated with another tetrahedron,as in the crystalline structures. In the second model,the SiO2 is set from miniature crystallites of allotropic types of crystallineSiO2. The integrated sio2 nano particles was presented to air plasma. The plasma surface change strategy is biologically cordial and non harmful. The plasma-treated Sio2nanoparticles and untreated nano composites were described by XRD,PL study, I-V conductivity, photoconductivity, TG/DTA.

Materials and techniques

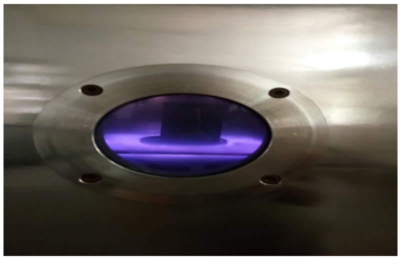
Rice husks (RH) were gathered from a neighborhood rice factory with the husk measurement of 7-10 mm long,1.5-2.5 mm wide and 0.10-0.16 mm thick. Dry crude rice husks were washed with water to eliminate the dirt and different contaminations and afterward dried in the daylight for 24 hrs. These were marked as crude rice husk (RRH).Acid dying was refined by treating the RRH with weaken HCl (1:1) and distilled water for 2hour,followed by dilute ammonia arrangement (10 vol. %) for 1 hr to eliminate the hints of corrosive. The treated husk was taken out and washed with distilled water checked by drying air for 24 hrs. Around 5 g tests of RRH and corrosive treated rice husk (ARH) were introduced into a suppress heater for pyrolysis at various temperatures changing from 800^0C .The Black debris (Sic) and White debris (sio2), powders were readied .[2]



A.RICE HUSK ASH

PLASMA TREATMENT:

Non – thermal plasma was caused utilizing a dc glow discharge chamber. Air was utilized as a plasma . The release chamber was first cleaned and air fixed. Air in the chamber was emptied utilizing vacuum siphon. The necessary pneumatic stress was allowed through gas needle valve and the pressing factor was estimated by pirani check. The cathodes inside the chamber was fited opposite to the pivot and were isolated by a distance of 6 cm. The separation from the terminal to the example is 3cm.The capability of 400V is applied to cathodes. After consistent release plasma RRH debris was presented opposite to the pivot through Teflon stick. Treatments were finished under the release capability of 400V with 15 mins openness time. The aftereffect of the treated RRH debris was contrasted and that of the untreated RRH debris.



B.PLASMA CHAMBER.

STRUCTURAL ANALYSIS

The XRD strategy was applied to identify the crystalline phase of sample**..** The diffraction design improved a wide top with its middle at 2θ = 22°,which is identified with the qualities got . This figure(1) shows a formless construction with no crystalline pattern in both plasma treated and untreated example . The increment in power of the Si-O bond after plasma treatment demonstrates the response of oxygen iotas with the Si particles during the plasma-treatment process.The plasma release restricted dynamic species that lead to the arrangement of radicals.Further O2 molecules joining to Si molecules in an increase in the centralization of Si-O bonds[3] .

PHOTOLUMINUS STUDIES

PL spectra are 270-480 nm respectively .Intensity is increased when compared to plasma untreated sio_2.The band gap is unnatural by the surface termination through modifying physical expansion of lattice.On the surface of sio_2 large number of Si and O terminations are moulded after plasma treatment and the intensity was improved. The quantum confinement of sio_2 may be the source of blue in PL emission[4].

THERMO GRAVIMETRIC ANALYSIS:

The investigation of the adjustment in the mass of an example on warming is known as Thermo gravimetric examination (TG).TG estimates mass changes in a material as a component of temperature (or time) under a deliberate air. TG is generally significant for lack of hydration, deterioration, desorption, and oxidation measures.The most comprehensively utilized warm strategy for investigation is Differential warm examination (DTA). In DTA, the temperature of an example is contrasted and that of an idle position material during an arranged difference in temperature. The temperature ought to be the equivalent until warm occasion emerges, like softening, deterioration in the gem structure.The TG/DTA examination of SiO2nano particles are in Fig.3The plasma untreated example have two primary district of weight loss,the first area is 20 to 80^0 c weight reduction joined by addressing water evacuation of the example and the absolute weight reduction is 5.9%,where the DTA bend shows an endothermic band.The second locale is at 100 to 480^0 c the weight reduction is joined by addressing carbon oxidation expulsion as CO and CO2.The complete weight reduction is 6.3%, where the DTA bend shows an exothermic pinnacle. plasma untreated example have two fundamental locale of weight loss.The first district is 20 to 80^0 c weight reduction went to by demonstrating water expulsion of the example and the all out weight reduction is 9.6%, where the DTA bend shows an endothermic band.The second area is at 100 to 480^0 c the weight reduction is exhibiting carbon oxidation evacuation as CO and CO2.The complete weight reduction is 3.9%, where the DTA bend shows an exothermic pinnacle.

PHOTOCONDUCTIVITY STUDIES:

The field reliant dark and photoconductivity of plasma treated and untreated sio_2nano particles are shown in figure[4a and 4b] .The plot explains a linear increase of current in dark and visible light irradiated samples with increase in applied voltage showing the ohmic nature. plasma treated nano particles exposed better dark and photo currents compared to untreated sio_2nano particles.

I-V CHARACTERISTICS ANALYSIS:

The electrical conductivity of sio_2nano particle was defined by four terminal technique results of which showed that plasma treated nano particles electrical conductivity were increased and obey arhenius law,oxygen having functional group which is responsible for increasing conductivity[5].

CONCLUSION

Investigating the properties of plasma treated sio_2nano particles such as physical, structural, optical, thermal at the function of compositional changes.

Structural features of samples are analysed using XRD studies ,it has been found that $sio_2$is amorphous structure. Thermal properties of samples were analysed bythermo gravimetric analysis from ambient condition. Plasma treated sample has better thermal stability. Photoconductivity and I-V characteristics graph shows plasma treated sio_2 has more electrical conductivity when compared to untreated.

ACKNOWLEDGMENT

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Conflicts of interest

The authors declare no conflict of interest

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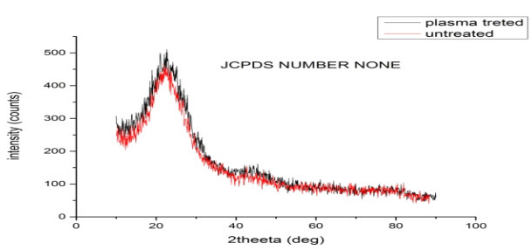

Fig 1. **XRD** pattern of sio2 at room temperature.with 400 volt and 15 mins for plasma treated and untreated

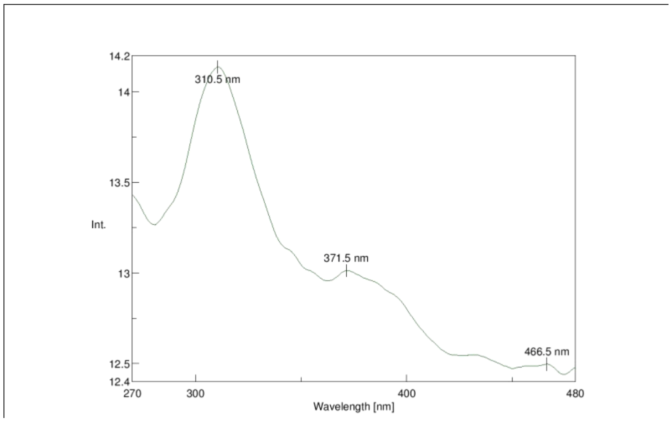

Fig :2(a) PL Spectrum of sio2 at room temperature for untreated

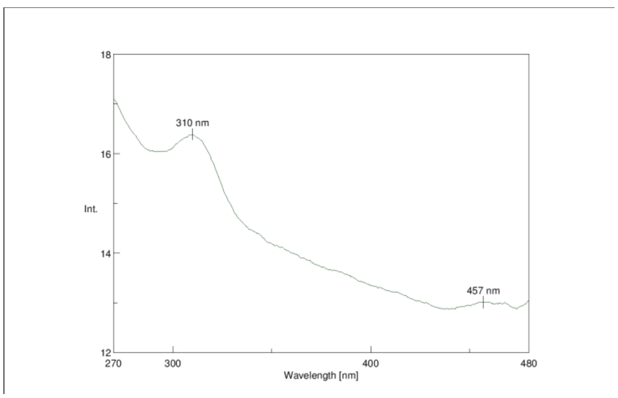

Fig :2(b) PL Spectrum of sio2 at room temperature with 400 volt and 15 mins for plasma treated

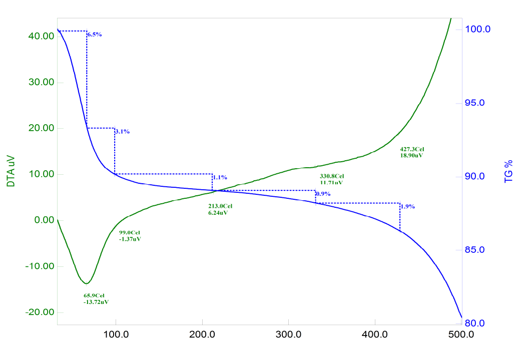

Fig:3(a) **TG/DTA** pattern of sio2 at room temperature for untreated

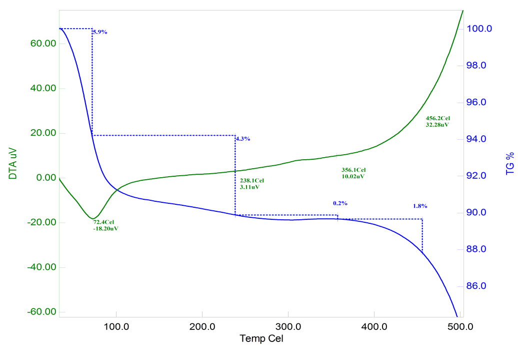

Fig: 3(b) **TG/DTA** pattern of sio2 at room temperature with 400 volt and 15 mins for plasma treated

PHOTOCONDUCTIVITY

LIGHT CURRENT

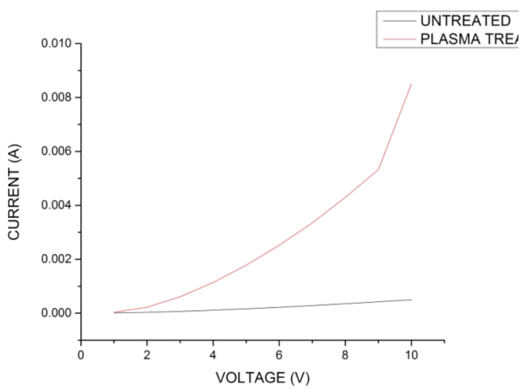

FIG 4(a) **LIGHT CURRENT** characteristics pattern of sio2 at room temperature with 400 volt and 15 mins for plasma treated and untreated

DARK CURRENT

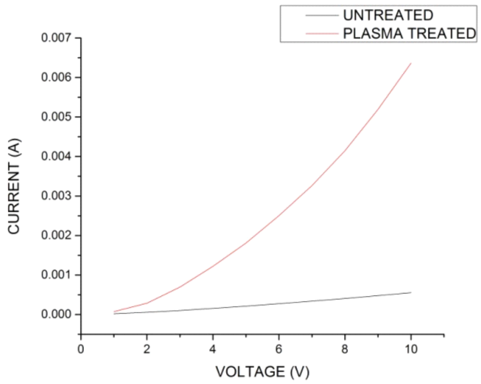

Fig:4(b) **DARK CURRENT** characteristics pattern of sio2 at room temperature with 400 volt and 15 mins for plasma treated and untreated

I-V CHARACTERISTICS

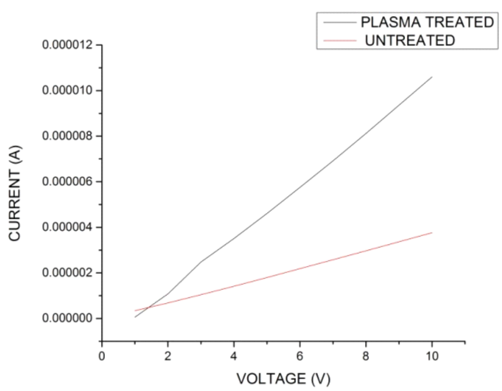

Fig:5 **I-V** CHARACTERISTICS pattern of sio2 at room temperature with 400 volt and 15 mins for plasma treated and untreated