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RESEARCH OF CEMENTITIOUS PROPERTIES IN PROSOPIS JULIFLORA ASH USING FTIR

R.Ganesh[1], B.Gobi[2], A. Kalidoss[3], M.Balagopi[4]

[1] *Assistant professor, Department of Civil Engineering, Kamaraj college of Engineering and Technology*,

[2, 3, 4] *UG Student, Department of Civil Engineering, Kamaraj college of Engineering and Technology*,

Abstract*:*

Cement is the one of the World's most significant manufactured material. 5% of the total release of CO_2 to the atmosphere is caused during the manufacturing for cement in cement industries. In an effort to reduce anthropogenic CO_2 emission and for the economic reasons by-products are used as cementitious materials. Reuse of a large amount of waste materials like fly ash, PJ ash, silica fume, are done in large extents in the manufacture of cement and cementitious products. Prosopis Juliflora Ash (PJA) is derived from the stem and roots of the PJ tree. In this paper the PJA sample is examined by using FTIR. The peak values from the FTIR test shows the functional groups present in the PJA sample and those functional groups are tabled. In this paper gives the clear view of using stem and roots of the PJ tree and make them as ecofriendly to environment.

Keywords—*FTIR, PJA, Fly ash, Silica fume*

I. INTRODUCTION

In the recent years, growing perception about worldwide environment and increasing energy security has led to increasing demand for renewable energy resources and to diversify current methods of energy production. Among these resources, biomass (forestry and agricultural wastes) is a promising source of renewable energy. In the current trends of energy production, power plants which run from biomass have low operational cost and have continuous supply of renewable fuel. It is considered that these energy resources will be the CO_2 neutral energy resource when the consumption rate of the fuel is lower than the growth rate. Also, the usage of wastes generated from the biomass industries (sawdust, woodchips, wood bark, saw mill scraps and hard chips) as fuel offer a way for their safe and efficient disposal. Wood wastes are commonly preferred as fuels over other herbaceous and agricultural wastes as their incineration produces comparably less fly ash and other residual material. As wood ash primarily consists of fine particulate matter which can easily get air borne by winds, it is a potential hazard as it may cause respiratory health problems to the dwellers near the dump site or can cause groundwater contamination by leaching toxic elements in the water.

Combustion of coal in thermal power plants results in the emission of SO2, NO2, other toxic gases and enormous quantities of fly ash comprising particulate matter collected from the flue gas stream. Fly ash is hazardous for living organisms because of its minute particle size and the presence of potentially toxic elements like vanadium, antimony, arsenic, boron, aluminum and chromium, which limit the survival and growth of plants. It also adversely affects microbial population of soil by decreasing their respiration and enzymatic activities and, in turn, lowers the soil fertility. India produces more than 60 million tonnes of fly ash every year and its management is a major problem. The ash is disposed off either through the wet method (slurry form) or the dry method (ash ponds). Profitable use of the fly ash in manufacture of bricks, blocks or cement, construction of roads and embankments and in agriculture-related areas as land reclamation, quarry restoration, and land filling has been demonstrated. Other uses, such as metal extraction and employing fly ash as a conditioner in wastewater treatment, have been demonstrated. However, unmanaged ash disposal serves as a major source of dust, which has a potential impact on the visibility of the surrounding sites, poses a health hazard and contributes to the deterioration of surface and ground water quality.

II.LITERATURE REVIEW

Toufik Boubekeur, Bensaid Boulekbache this paper importance on Mortars samples have been subjected to flexural and compressive tests and to 1% HCl, 3% H2SO4, 5% Na2SO4 and 5% MgSO4 attacks. The combination of LP and GGBFS is complementary on strength properties of mortar. The maximum strength is around 10% of LP and 10% of GGBFS at early age [3]. The result were determined the compressive strength of the mortar mix of specimens was prepared with the ternary alkali alumino silicate cement 42.4 Mpa at 28 days in increase to 30% compared in Portland cement 32.4 Mpa [2]. In this paper shows about the difference in Split tensile strength between the control mix (15%) 22% reduction compressive strength the compared to the control mix. The increase on flexural strength and peak value(15%) increase shows 13% increase in strength compared to the concrete mix 28 days [7].Y.Li,A.K.H.Kwan determined the The Maximum cube strength with 40% FAM and 10% CSF added attained was 34% at a W/C ratio by mass of 0.289 [4] .The paper shows about the prosopisjuliflora ash are replaced in cement at 20%, 30%, 40%. The concrete test are conducted and to find out the workability. it fills more voids and provides superior pore structure and thereby improves its strength at later stages due to reduced permeability [6]. Adhityo Wicaksono a , Saifullah Hidayat concluded that characteristics of biomechanical attachment exhibited by two morphologically different mudskipper species, Boleophthalmus boddarti (with fused pelvic fins) and Periophthalmus variabilis (with infused pelvic fins). P. variabilis is a tree and rock climber while B. boddarti dwells in the muddy shallows and is unable to climb. They found the chemical and functional group present in this species and by using the FTIR test. Using FTIR spectroscopy, they found that both species of mudskipper-per secrete monopoly saccharides and using molecular dynamics methods we found that these mucus polysaccharides are likely to aid Stefan adhesion in both species [15].

III.CONCEPTIONAL INTRODUCTION FOR FTIR

Measurement of FTIR spectra of FSA extracted from calibration and iodization of sample taken from fish wastes is observed using an ABB MB3000 FTIR spectrophotometer in the mid-infrared region of 400-4000 cm-1. This instrument is equipped with deuterated triglycine sulphate (DTGS) detector, with a resolution of 4cm-1 and 45 scanning. Fourier-transform spectroscopy is a less intuitive way to obtain the same information. Rather than shining a monochromatic beam of light (a beam composed of only a single wavelength) at the sample, this technique shines a beam containing many frequencies of light at once and measures how much of that beam is absorbed by the sample. Next, the beam is modified to contain a different combination of frequencies, giving a second data point. This process is rapidly repeated many times over a short timespan. Afterwards, a computer takes all this data and works backward to infer what the absorption is at each wavelength.

The beam described above is generated by starting with a broadband light source—one containing the full spectrum of wavelengths to be measured. The light shines into a Michelson interferometer—a certain configuration of mirrors, one of which is moved by a motor. As this mirror moves, each wavelength of light in the beam is periodically blocked, transmitted, blocked, transmitted, by the interferometer, due to wave interference. Different wavelengths are modulated at different rates, so that at each moment the beam coming out of the interferometer has a different spectrum.

As mentioned, computer processing is required to turn the raw data (light absorption for each mirror position) into the desired result (light absorption for each wavelength). The processing required turns out to be a common algorithm called the Fourier transform. The Fourier transform converts one domain (in this case displacement of the mirror in cm) into its inverse domain (wavenumbers in cm−1). The raw data is called an "interferogram

Fig.1: FTIR Function group

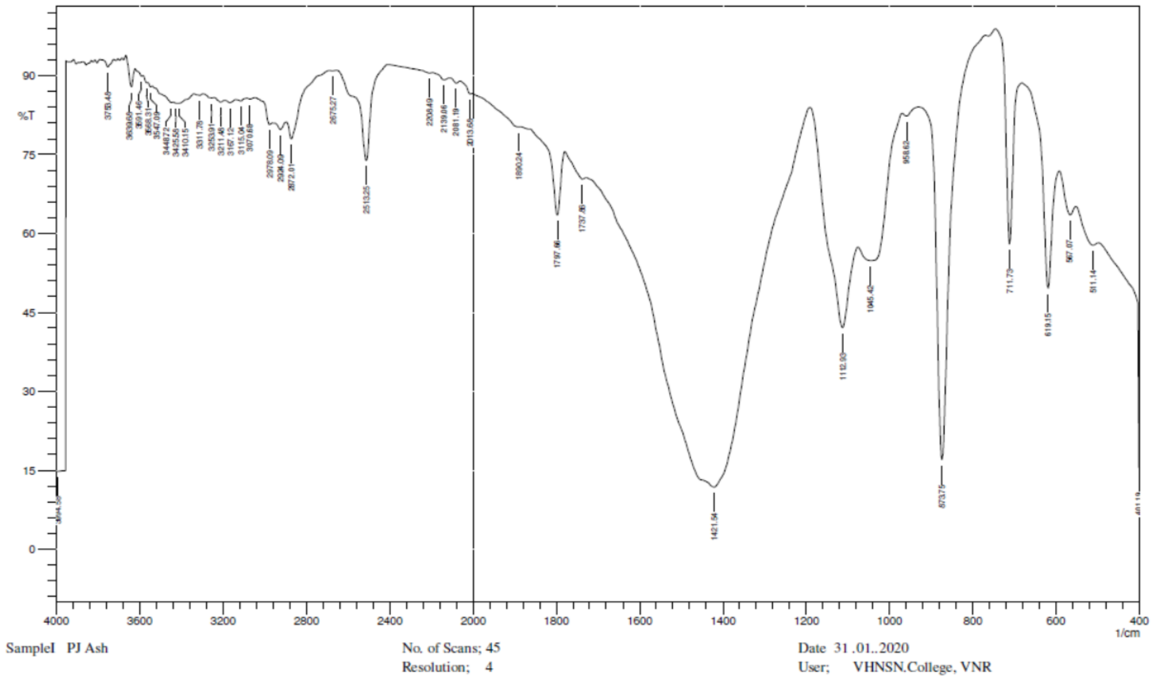
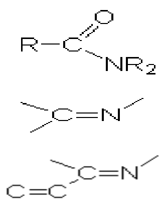
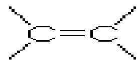
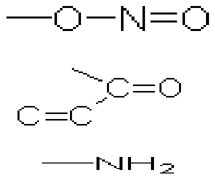
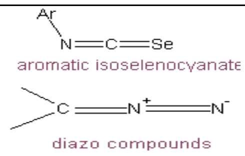


Table.1:FTIR Function group

S.No	Wave length (cm^{-1})	Functional Group
1	1470 – 1430, 1460 - 1430	$—CH_3$, $>CH_2$, $>N—N=O$
2	1425 – 1370, 1440 - 1350	C—N=O, $RO-SO_2—OR'$
3	1600 - 1500	$—NH_3^+$
5	1075 - 1020	C–O–C
6	1075 – 1030, 1100 - 1030	C-Br (aromatic) C-Cl (aromatic)
7	1150 – 1070, 1270 – 1100, 1200 - 1050	>C=S C-F (aromatic)

9	1655 – 1635, 1670 – 1630, 1690 – 1640, 1660 – 1630, 1680 - 1620	0-amino- or o-  hydroxyarylketones 
10	1625 – 1610, 1640 – 1590, 1650 - 1560	
11	2000 – 2200, 2000 - 2050	
12	3250 - 3450, 3400 – 3450	----NH2 ---N

The table.1 shows clear view of the wave length and their functional group. The PJA sample contains peak wavelength of 1600-1690 cm-1 this peak point shows the functional group of 0-amino- The peak value of 1500 cm-1 shows the functional group of N-O stretching (nitro compound). The graph gives a third peak value of 1421 cm-1 show the functional group of O-H bending (alcohol). The wavenumber of 570 cm-1 shows the functional group of C-I stretch (halo compound). The wavenumber 603.72 cm-1 shows the functional group of C-Br stretching (halo compound). The wavenumber 2013.68 cm-1 shows the functional group of N=C=S (isothiocyanate). The wave number is 3442.94 cm-1 (O-H stretching). These are the peaks points obtained from the FTIR test for the PJA sample.

IV.CONCLUSION

Prosopis juliflora is a shrub or small tree in the family Fabaceae, a kind of mesquite which is considered to be a potential threat for ground water in South India. Hence, this has to eradicate so as to maintain the groundwater and also to effectively utilize its ash thereby reducing environmental pollution, this can be used as a partial replacement for cement. In this regard, this paper investigates the FTIR test is carried out to find the functional group present in the PJA carried out and the functional group are tabled to get the clear view of the functional group present in the PJA sample.

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