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VALORIZATION OF FLY ASH

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Abstract: For producing thermal energy in thermal power plants coal is combusted. Ash is a bye product of combustion of coal. Two types of ash is produced 1) bottom ash and 2) fly ash. Fly ash is light in weight and the small size particles come out from the upper part of the chimney. The particles are collected in ash ponds by electro static precipitation. The fly ash mainly contains oxides of metals such as silicon, aluminum, iron, calcium, sodium, magnesium, manganese, titanium etc. The fly ash has a good binding property [1]. Due to this property fly ash is used in the preparation of cement, bricks, tiles, pavers and so many other applications [2, 3, 4]. The researchers are working on valorization of it in environment-friendly and economically viable ways.Biomass ash is produced when biomass such as bagasse, soya stalks, rice husk are used for combustion in small scale thermal power plants. This ash also contains oxides of silicon, aluminum, iron, titanium etc. BMA can be used to prepare glasses and glass ceramics [5,6,7,8].From the study of optical properties of glasses prepared by using BMA (biomass ash) it was found that the glasses are capable of absorbing UV rays[6].

Keywords: Fly ash, Metal oxides, Binder property, Cement, Valorization, BMA

Introduction:

In India, of the total power generation, around 61% is thermal energy obtained by burning of coal. The combustion of coal results into ash as a bye product. The ash produced is of two types, 1) heavy bottom ash given out from the bottom of the chimney and 2) light weight fly ash given out from the top of the chimney. This light weight fly ash particles are collected in ash ponds by electrostatic precipitation method. The ash is collected near the power plants there by resulting into large heaps of ash and therefore fly ash management is an important area of national concern. In early days it was only used in landfills and reclamations. But from last few years Government of India has started, 'Fly Ash Mission', and is promoting its use in different industrial fields. Fly ash has a binding property due to which it has tremendous potential to be utilized in making of cement, tiles, pavers, bricks etc. Several Government and NGOs are involved in fly ash utilization and safe disposal efforts in the country. As a result of this around 33 % ash produced was recycled in the year 2014-15[9].

The fly ash basically contains oxides of various metals such as silica (SiO_2), alumina (Al_2O_3), iron (Fe_2O_3), calcium (CaO), sodium (Na_2CO_3), titanium (TiO_2)etc. It is also found to contain oxides of heavy metals like cobalt, nickel, cadmium, lead, mercury. Thus it is essential to dispose it safely without causing any damage/pollution of air, water or land.

Biomass ash is produced on combustion of biomass (i.e. plant produce such as sugar cane leaves, baggase, rice husk, soya leaves and stalks etc) in small scale thermal power plants . Though the produce is small in volume but slowly and steadily it may damage the environment. This also shows similar composition as coal fly ash i.e., it also contains oxides of various metals. Many researchers are working on it to develop value added products [6, 7, and 8].

The major content of fly ash is silica (40-60%) and next is alumina (14-20%). Fly ash is classified into two types according to the type of coal used. Anthracite and bituminous coal produces fly ash classified as class F. Class C fly ash is produced by burning lignite or sub-bituminous coal. Class C fly ash has self-cementing or pozollanic properties (capacity to react with lime in the presence of water at room temperatures to form a solid and water insoluble cement like substance).

Materials and method- The fly ash /BMA (Biomass ash) is subjected to chemical analysis. It is found to contain silica and alumina. Silica and alumina both are glass formers. The BMA is compounded with other glass forming chemicals such as

boric oxide, calcium oxide, zinc oxide in suitable proportion. Then it is fired in a furnace at a suitable temperature of 950°C to 1000°C till its melting. The melt is quenched to room temperature on a suitable metal disc to form the glasses. The glasses are annealed at 150°C to reduce the mechanical stresses formed due to quenching. The glasses thus prepared are now subjected to different characterization techniques such as X-Ray diffraction to confirm the amorphous nature of the glass. The FTIR study confirms the ingredients present in the composition. The UV-near Vis spectrum is studied to know its effect on glasses. Bansod et al [6] studied optical properties of glasses prepared by using BMA in the UV-VIS range and found that the glasses absorb rays from ultra violet region and thus can be used in exterior wall paint as UV absorber.

The fly ash is used to prepare cement, floor tiles or bricks with suitably compounding it with lime (calcium hydroxide), gypsum (calcium sulphate) and sand, the composite is mixed well and bricks are prepared from mould by applying pressure. The bricks are allowed to dry and on drying the bricks are available for use.

Result and discussion:

The biomass ash is an important bye product which can be transformed into value added products. Similarly fly ash is available in abundance. Due to its binding property it can be used in making cement, bricks, tiles for roof or flooring etc. It can also be used to prepare manure. The government is promoting and also sponsoring various projects for safe and easy disposal of fly ash and converting it into value added products. Researchers should come forward and work for betterment of the environment and the society also.

References:

OzlemCelik, ErdemDamc, SabriyePiskin (2008), Characterization of fly ash and its effects on the compressive strength properties of Portland cement, Indian Journal of Engineering and Materials Sciences, Vol 15, P 433-440.

Joshi S. V., Ubale S.K.(2014),'RECYCLING OF WASTE PRODUCTS: A GREEN INITIATIVE', International Journal of Researches in Biosciences, Agriculture & Technology, ISSN No.Online , 2347-517X, P

Tiwari M.K., Bajpai S., Dewangan U.K.,(2016) Fly Ash Utilization: A Brief Review in Indian Context ', International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056 Volume: 03 Issue: 04 www.irjet.net p-ISSN: 2395-0072.

Chatterjee A. K.(2010), ' Indian fly ashes, Their characteristics and potential for Mechano-Chemical activation for enhanced usability', Main Proceedings ed. J.P.Claisse, T.R.Naik,N. Ganjan ISBN978-1-4507-1490-7,
http://www.Claisse.info/Proceedings.html

Bansod S. M., Ubale S.K.(2014) 'Preperation of glass from biomass ash and study of its properties', International Journal of Researches in Biosciences, Agriculture & Technology, ISSN No. Online, 2347-517X,

Bansod S. M., Ubale S.K.(2017), 'To prepare Silica Soda Borate Glass from Biomass Ash and study its Optical Properties', International Journal of Engineering Research and Technology (IJERT) ISSN:2278-0181

Teixeira SR, Magalhães RS, Arenales A, Souza AE, Romero M, Rincón JM,(2014) Valorization of sugarcane bagasse ash: producing glass-ceramic materials. J. Environ Manage.134:15-9.

Hariharan V., Shanmugam M., Amutha K. and Sivakumar G.(2014), 'Preparation and Characterization of Ceramic Products Using Sugarcane Bagasse ash Waste', Research Journal of Recent Sciences , ISSN 2277-2502 Vol. 3(ISC-2013), 67-70 .

Gurdeep Singh (*2013),* 'Environmental Aspects of Coal Combustion Residues from Thermal Power Plants','Thermal Power Plants - Advanced Applications", *book edited by Mohammad Rasul, ISBN 978-953-51-1095-8.*

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