CHARACTERIZATION OF VARIOUS KINDS OF REFUSED DERIVED FUEL AND THEIR EFFECTS ON CEMENT PROPERITES

Submitted By

Hani Mashhout Abd Elhamed Ahmed

B.Sc. of Science (Chemistry/Physics), Faculty of Science, Cairo University, 2001

A thesis submitted in Partial Fulfillment

Of

The Requirement for the Master Degree

In

Environmental Sciences

Department of Environmental Basic Sciences

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APPROVAL SHEET

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Hani Mashhout Abdelhamed Ahmed

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Abstract

Recently, there is an increasing demand for using refused derived fuels (RDF) as replacement for traditional fossil fuel in energy intensive industries like cement industry. However, using such sources will affect the properties and quality of the produced cement since RDF ash was mixed with OPC clinker during production. In the present study, eight solid refused derived fuels namely; rubber waste, tree trimmings, rice straw, municipal solid wastes, paper waste, saw dust, cane waste and plastic waste, are characterized and tested as RDF. Also, the effect of their ash on the setting and hardening of the hardened OPC pastes was investigated. Results showed that plastic waste has the highest calorific values followed by rubber waste.OPC pastes mixed with RDF ash showed reduced setting times. Besides, OPC admixed with rubber wastes ash offered the highest compressive strength values between all the studied RDF sources. Phase composition of the formed hydrates is studied by X-ray diffraction analysis and results showed that the ash within OPC matrix does not change the hydration mechanisms since the same hydration products are formed.

Keywords: Portland cement, Reused drive fuels, rubber Waste, MSW, Energy

List of Contents

List of Abbreviation

Symbol	Description
AF	Alternative Fuel
AFR	Alternative Fuels and Raw Materials
C.V	Calorific value
C2S	Dicalcium silicates
C3A	Tricalcium aluminates
C3S	Tricalcium silicates
C4AF	Tetra calcium aluminate ferrate
CKD	cement kiln dust
CO_2	Carbon Dioxide
CSH	Calcium Silicates Hydrates
CW	Cane waste
EF	Engineered Fuel
ESPs	Electrostatic precipitator
G J	Giga Joule
GHG	Green House Gas
HARDF	High ASH content RDF
LARDF	Low ASH content RDF

Symbol	Description
LHV	lower heating values
LOI	Loss On Ignition
MBT	mechanical biological treatment
MC	Moisture Contents
MSW	Municipal Solid WASTE
MSW	municipal solid waste
MT-plant	mechanical treatment plant
NCV	net calorific value
NOx	nitrogen oxides
OPC	Ordinary Portland cement
P_AW	Paper waste
PCBs	polychlorinated biphenyls
PDF	Packaging derived Fuel
P_LW	Plastic waste
RDF	Refused Derived Fuel
REF	Recovered Fuel
RHA	Rice Husk Ash
RS	Rice straw