

# Critical Review on Strength and Durability Properties of Concrete using Incinerated Biomedical Waste Ash

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**Abstract:** Waste generation has increased considerably worldwide in the last few decades. Solid wastes encompass the heterogeneous mass of throwaways from the urban community as well as the homogeneous accumulations of agricultural, industrial and mineral wastes. Waste generated from biomedical activities represents a real problem of living nature and human world. A proper waste management system should be required to dispose hazardous biomedical waste and incineration should be the best available technology to reduce the volume of this hazardous waste. The incineration process destroys pathogens and reduces the waste volume and weight but leaves a solid material called biomedical waste incineration ash as residue which increases the levels of heavy metals, inorganic salts and organic compounds in the environment. Disposal of biomedical waste ash in landfill without proper treatment may cause contamination of groundwater due to leachate as metals are not destroyed during incineration. The limited space and the high cost for land disposal led to the development of recycling technologies and the reuse of ash in different systems. There is a scope of utilization of incinerated biomedical waste ash (IBWA) in the production of concrete. This review of literature research paper is intended to evaluate the feasibility of using biomedical waste ash as partial replacement of cement in concrete.

**Keywords:** Biomedical waste Ash-Strength and durability properties of Concrete feasibility studies of using BMWA-Future prospects

## REFERENCES

- [1]. Udit Kumar, Vikas Srivastava, Amit Kumar Singh "Suitability of Biomedical Waste Ash in Concrete" International Journal of Engineering and Technical Research (IJETR), Volume-5, Issue-2, June 2016.
- [2]. Kailash Narayan Katare, Nitin Kumar Samaiya, Yogesh Iyer Murthy "Strength and durability properties of concrete using incinerated biomedical waste ash" 2023.
- [3]. M. Anand, Sanjay Chandra "An Experimental Study and Analysis on Partial Replacement of Cement with Hospital Waste Ash in Concrete" Journal of Engineering science, Volume-10, Issue 12, DEC/2019, Pages: 1249-1259.
- [4]. Sabo Bala, Hassan Abba Musa "Flexural Strength of Concrete beam using Hospital Waste Ash as replacement" International Journal of Scientific and Research Publication, Volume-7, Issue 11, November 2017, Pages-391-400.
- [5]. Lubna K. Hamada, Zainab Z. Ismail "Sustainable Approach for Recycling Medical Waste Needles to Partially Replace Aggregate in Lightweight Concrete Production" Advances in Science and Technology Research Journal 2021, 15(1), Pages: 166-173.
- [6]. T. Ahmed, R. Chowdhury and M. Rahman "Stabilization of medical waste incineration fly ash in cement mortar matrix" Bangladesh Journal of Scientific and Industrial Research, Res. 55(2), Pages: 131-138, 2020.

- [7]. Menker Girma and Belachew Asteray “Fresh, Mechanical, and Microstructural Properties Investigation on the Combined Effect of Biomedical Waste Incinerator Ash and Bagasse Ash for High-Strength Concrete” *Advances in Materials Science and Engineering*, Volume 2022, Article ID 5685372, 15 pages.
- [8]. B. Prasanth, V. Ranga Rao “Flexural Strength and Durability of Concrete by Partial Replacement of OPC with Biomedical Waste Ash and Metakaolin” *International Journal of Recent Technology and Engineering (IJRTE)* ISSN: 2277-3878, Volume-7, Issue-6C2, April 2019 .
- [9]. Asefchew Belete Tseganeh ,Henok Fikre Geberegziabher, Ayele Tesema Chala “Stabilization of Expansive Soil Using Biomedical Waste Incinerator Ash” *Journal of Management Science & Engineering Research* ,Volume -04, Issue 02 , September 2021,Pages:49-58.
- [10]. Shazim Ali Memon, Muhammad Ali Sheikh, And Muhammad Bilal Paracha “Utilization of Hospital Waste Ash in Concrete” *Mehran University Research Journal of Engineering & Technology*, Volume -32, No. 1, January, 2013 [ISSN 0254-7821].
- [11]. Surinder Gopalrao Wawale, Mohammad Shabaz, Abolfazl Mehbodniya, Mukesh Soni, Nabamita Deb, Mohamed A. Elashiri, Y. D. Dwivedi, and Mohd Naved “Biomedical Waste Management Using IoT Tracked and Fuzzy Classified Integrated Technique” *Human-centric Computing and Information Sciences* July 15,2022.
- [12]. Harish T. Mohan, Karingamanna Jayanarayanan, K.M. Mini “A sustainable approach for the utilization of PPE biomedical waste in the construction sector” *Engineering Science and Technolog*, an International Journal Volume- 32 (2022) 101060.
- [13]. M. Kanta Rao, and Ch. N. Satish Kumar “Influence of fly ash on hydration compounds of high-volume fly ash Concrete” *AIMS Materials Science*, Volume- 8, Issue 2,Pages: 301–320.
- [14]. Suresh Kumar A, Muthukannan M, Arun Kumar K, Chithambar Ganesh A, and Kanniga Devi R “Mathematical Prediction on the strength and behaviour of structural member by incorporating Incinerated Bio-Medical Waste Ash in Ground Granulated Blast Furnace Slag based Geopolymer Concrete” *Turkish Journal of Computer and Mathematics Education* Volume-12 No.10 (2021),Pages: 4070-4079.
- [15]. Apurv kadu,V.K.Gajghate “Optimization of Hypo Sludge Ash in Design Mix Concrete: A Review” *IJSTE - International Journal of Science Technology & Engineering* ,Volume -2 Issue 07 , January 2016,Pages:133-135.
- [16]. K.Malavan ,R.Manju “ An Experimental Investigation on Bio-Medical Waste Concrete” *SSRG International Journal of Civil Engineering special issue 2017*,Pages:369-375.
- [17]. O. O. Aderinola, Y. Yusuf and O. O. Omotayo “Assessment of Cement Concrete Partially Replaced With Polystyrene And Plantain Peel Ash” *Nigerian Journal of Technology (NIJOTECH)*, Volumer-39, No. 3, July 2020, Pages: 694 – 700.
- [18]. .A. Chithambar Ganesh, M. Vinod Kumar, K. Mukilan, A. Suresh Kumar, K. Arun Kumar “Investigation on the effect of ultra fine rice husk ash over slag based geopolymer concrete” *Research on Engineering Structures & Materials* Volume-9(1), (2023) Pages :67-81.
- [19]. Bashir Ahmed Memon, Ghulam Mustafa Khanzada, Mahboob Oad and Abdul Hafeez Buller “Tensile Strength of Concrete With Biomedical Waste Ash” *World Journal of Engineering Research and Technology*, 2020, Volume- 6, Issue 5,Pages:81-90.
- [20]. Anitha Krishnan, Senthil Selvan Subramanian “An investigation on the mechanical and microstructural properties of pigeon pea stalk ash concrete: An approach towards environmental sustainability” *Research Square*, December 5th, 2022.
- [21]. P. Srinivas and K. Satish Kumar “Utilization of Incinerated Municipal Solid Waste Ash in the Manufacture of Cement Hollow Bricks” *Nature Environment and Pollution Technology*, Volume-8, No. 2, 2009, Pages:329-334.
- [22]. unaid Hassan, Imtiaz khan, Fawad, Iqtidar Ali “Use of Hospital Waste as a Partial Replacement of Cement” *Global Scientific Journal*, Volume - 8, Issue 3, March 2020, Pages:692-698.

- [23]. MG Pranav, Jayadeep Reddy D, Basavaraj Ninganna Meti, Satwik H “Mechanical and Microstructural Assessment of Agro-Waste-Based Cementitious Materials” International Research Journal of Modernization in Engineering Technology and Science, Volume -05, Issue:01,January-2023,Pages:291-294.
- [24]. Wayan Koko Suryawan, Gita Prajati and Anshah Silmi Afifah “Bottom and Fly Ash Treatment of Medical Waste Incinerator from Community Health Centres with Solidification / Stabilization” AIP Conf. Proc.2114, Pages: 050023-1–050023-6.
- [25]. Sandeep Singh, Gurpreet Singh, Rajat Verma “Evaluations GGBS, Metakaolin and Waste Medicine Wrappers for Sustainable Construction” European Journal of Molecular & Clinical Medicine ISSN 2515-8260,Volume- 07, Issue- 07, 2020.
- [26]. Suresh Kumar A, Muthukannan M and Sri Krishna I “Optimisation of bio medical waste ash in GGBS based of geopolymer concrete IOP Conf. Series: Materials Science and Engineering ,872 (2020) 012163.
- [27]. Anita Rajor and Kunal “Bio-Medical Waste Incinerator Ash: A Review with Special Focus on Its Characterization, Utilization and Leachate Analysis” International Journal of Geology, Earth and Environmental Sciences ISSN: 2277-2081, Volume- 1 (1) September-December2011, Pages:48-58.
- [28]. Saman Rahimireskati, Kazem Ghabraie, Estela Oliari Garcez and Riyadh Al-Ameri “Prediction of the Mechanical Performance of High-Strength Concrete Containing Biomedical Polymeric Waste Obtained from Dialysis Treatment” Applied Science 2021, Volume - 11, 2053.
- [29]. Sari Jaber, Alaa Aldin Aljawad, Tudor Prisecaru1 and Elena Pop “The environmental situation of the ash medical waste in Baghdad city, Iraq” E3S Web of Conferences,Volume- 286, 02017 (2021).
- [30]. Augustine U. Elinwa “Hospital Ash Waste-Ordinary Portland Cement Concrete” Science Research 2016,Volume-4(3),Pages: 72-78