

Properties of Industrial Slag as Fine Aggregate in Concrete

A. Ananthi^{1,*}, J. Karthikeyan²

¹ Research Scholar, Department of Civil Engineering, National Institute of Technology, Tamilnadu, India

² Assistant Professor, Department of Civil Engineering, National Institute of Technology, Tamilnadu, India.

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Abstract

The main objective of this paper is to use the industrial waste such as bottom ash and weld slag (WS) as the partial replacement for fine aggregates in concrete. This paper presents the chemical analysis and strength properties of industrial solid waste such as bottom ash, weld slag 1 (WS 1) and weld slag 2 (WS 2). Their chemical compositions were identified by X-ray powder diffraction (XRD) analysis. The qualitative and quantitative elemental analysis of the bottom ash and weld slag was recognized by energy dispersive X-ray analysis and their morphology were studied by Scanning Electron Microscope (SEM). The compressive strength of concrete with 10% replacement of fine aggregate to the industrial waste shows higher strength than the normal concrete and hence this industrial waste can be used as fine aggregate in concrete.

Keywords: industrial waste, bottom ash, weld slag, XRD analysis, EDS analysis, compressive strength

Reference

- [1] K. S. Al-Jabri, "Effect of copper slag as a fine aggregate on the properties of cement mortars and concrete," *Construction and Building Materials*, vol. 25, pp. 933-938, 2011.
- [2] J. De Brito and N. Saikia, *Recycled aggregate in concrete, green energy and technology*, London: Springer-Verlag, 2013.
- [3] S. Geetha and K. Ramamurthy, "Properties of sintered low calcium bottom ash aggregate with clay binders," *Construction and Building Materials*, vol. 25, no.4, pp. 2002-2013, 2011.
- [4] R. Annoni, P. S. Souza, M. Petrániková, A. Miskufova, T. Havlík, Mansur MB., "Submerged-arc welding slags: Characterization and leaching strategies for the removal of aluminium and titanium," *Journal of Hazardous Materials*, vol. 244-245, pp. 335-341, 2013.
- [5] Y. Bai, F. Darcy, P. A. M. Basheer, "Strength and drying shrinkage properties of concrete containing furnace bottom ash as fine aggregate," *Construction and Building Materials*, vol. 19, no. 9, pp. 691-697, 2005.
- [6] P. Aggarwal, Y. Aggarwal, S. M. Gupta, "Effect of bottom ash as replacement of fine aggregates in concrete," *Asian journal of civil engineering (Building and Housing)*, vol. 8, no.1 pp. 49-62, 2007.
- [7] S. C. Kou, C. S. Pan, "Properties of concrete, prepared with crushed fine stone, furnace bottom ash and fine recycled aggregate as fine aggregates," *Construction and Building Materials*, vol. 23, no.8, pp. 2877-2886, 2009.
- [8] H. K. Kim, H. K. Lee, "Use of power plant bottom ash as fine and coarse aggregates in high-strength concrete," *Construction and Building Materials*, vol. 25, no.2, pp. 1115-1122, 2011.
- [9] W. Wongkeoa, P. Thongsanitgarna, K. Pimraksab, A. Chaipanicha, "Compressive strength, flexural strength and thermal conductivity of autoclaved concrete block made using bottom ash as cement replacement materials," *Materials and Design*, vol. 35, pp. 434-439, 2012.

* Corresponding author. E-mail address: ananthi.sivane@gmail.com

- [10] D. Bajare, G. Bumanis, L. Upeniece, "Coal combustion bottom ash as microfiller with pozzolanic properties for traditional Concrete," *Procedia Engineering*, vol. 57, pp.149-158, 2013.
- [11] C. E. Viana, D. P. Dias, J. N. F. Holanda, R. P. R. Paranhos, "The use of submerged-arc welding flux slag as raw material for the fabrication of multiple-use mortars and bricks," *Soldagem Insp. Sao Paulo*, vol. 14, no. 3, pp. 257-262, 2009.
- [12] S. T. Ramesh, R. Gandhimathi, P. V. Nidheesh, S. Rajakumar, S. Prateepkumar, "Use of furnace slag and welding slag as replacement for sand in concrete," *International Journal of Energy and Environmental Engineering*, vol. 4, no. 3, pp. 1-6, 2013.

