

Physical, Chemical and Environmental Properties of Natural and Construction/Demolition Recycled Aggregates

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Abstract : Uncontrolled disposal of construction and demolition waste (C & DW) in embankments in the periphery of cities causes both environmental and social problems, namely erosion, deforestation, water contamination and human conflicts. One of the milestones of EU Horizon 2020 Programme is the management of waste as a resource. To achieve this purpose for C & DW, a detailed analysis of the properties of these materials should be done. In this work we report the physical, chemical and environmental properties of C & DW aggregates from 25 different origins. The results are compared with those of common natural aggregates used in construction. Assays were performed according to European Standards. Additional analysis of heavy metals and organic compounds such as polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs), were performed to evaluate their environmental impact. Finally, properties of concrete prepared with C & DW aggregates are also reported. Physical analyses of C & DW aggregates indicated lower quality properties than natural aggregates, particularly for concrete preparation and unbound layers of road pavements. Chemical properties showed that most samples (80%) meet the values required by European regulations for concrete and unbound layers of road pavements. Analyses of heavy metals Cd, Cr, Cu, Pb, Ni, Mo and Zn in the C&DW leachates showed levels below the limits established by the Council Decision of 19 December 2002. Identification and quantification of PCBs and PAHs indicated that few samples shows the presence of these compounds. The measured levels of PCBs and PAHs are also below the limits. Other compounds identified in the C&DW leachates include phthalates and diphenylmethanol. In conclusion, the characterized C&DW aggregates show lower quality properties than natural aggregates but most samples showed to be environmentally safe. A continuous monitoring of the presence of heavy metals and organic compounds should be made to trial safe C&DW aggregates. C&DW aggregates provide a good economic and environmental alternative to natural aggregates.

Keywords : concrete preparation, construction and demolition waste, heavy metals, organic pollutants

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