



Title: Valorization of Drinking Water Treatment Sludges as Raw Materials to Produce Concrete and Mortar

Author: R.M. Ramirez Zamora, O. Ceron Alfaro, N. Cabirol, F. Espejel Ayala and A. Duran Moreno

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Abstract: The purpose of this work was to assess the technical feasibility to valorize sludges, generated and stored at the Los Berros drinking water facility (PPLB), as raw material to produce building products (mortar and concrete) for the construction industry. The experimental study was divided into three stages: 1) sampling and characterization of PPLB sludges to determine their potential as raw material (sand substitute and supplementary cementing materials) to produce mortar and concrete; 2) production and characterization of specimens, using sludge in different weight ratios of mixtures with cement, lime, commercial mortar and plaster to prepare mortars and concretes and 3) comparison of compressive strength and drying contraction values between each specimen and the Mexican criteria to build mortars and concretes. The characterization results of the PPLB sludges showed that these residues could be used as a sand substitute in mortar and concrete formulations, since they were mainly comprised of this material (46.83%). The specimens prepared with a) the binary formulations, sludge-cement and sludge-mortar (90-10%) and b) the ternary formulation, sludge-lime-cement (90-5-5%), gave the best results (ranging from 130 to 150 kg cmG²) of the compressive strength test. The compressive strength values of these formulations were higher than those of equivalent mortar (types I, II and III) and cement mixtures (125 kg cmG²) prepared according to the Mexican complementary technical criteria to design and build masonry. These cementing properties exhibited by the PPLB sludges might be associated to their high content of aluminum and silicon oxides, 31.98 and 33.23%, respectively. Thus, calcium silicate (the main carrier strength in hardened cement) can be produced from lime hydration of cement with the active silica present in the sludge. Considering all these results, the PPLB sludges present a high feasibility for being valorized as raw materials (supplementary cementing material and sand substitute) to produce building products for the construction industry.