Lightweight Artificial Aggregates from Mineral Waste Produced by A Low - Temperature Sintering Process

Adam Maslon
Rzeszow University of Technology, Poland

Maksymilian Ciesla
Rzeszow University of Technology, Poland

Renata Gruca-Rokosz
Rzeszow University of Technology, Poland

Malgorzata Franus
Lublin University of Technology, Poland

Katarzyna Kalinowska-Wichrowska
Bialystok University of Technology, Poland

Abstract

The research concerns the production of lightweight artificial aggregate from bottom sediments from water reservoir (BS), concrete dust from grinding concrete ceilings (CD) and municipal solid waste incineration fly ash (FA) in the low-temperature sintering process. Mineral wastes in the ratio BS:CD:FA = 0.4:0.4:0.2 with the addition of 6% CaO by weight were mixed, granulated, dried and sintered at temperatures of 200, 300 and 400 °C for 1 hour. Spherical aggregates were obtained, with dominant agglomerates of grain size 5.6-8.0 mm, which were classified as spherical according to BS EN 933-4:2008. The resulting aggregate had a grain density in the range of 1.69 - 1.79 g/cm³, a bulk density of 0.9 - 0.92 g/cm³, a total porosity of 31.5 - 33.6%, a water absorption of 11.3 to 13.43% and a compressive strength of 0.27 to 0.663 MPa, depending on the sintering temperature. These aggregates are inert in the environment and do not release harmful chemicals. The material can be classified as a lightweight aggregate according to BS EN 13055-1, which allows its use in lightweight non-structural concretes, lightweight mortars, geotechnics, horticulture, landscaping, and thermal and acoustic insulation.