

UNIVERSITY OF NIŠ
Faculty of Technology, Leskovac

BOOK OF ABSTRACTS

15th INTERNATIONAL SYMPOSIUM
„NOVEL TECHNOLOGIES AND SUSTAINABLE
DEVELOPMENT“

Leskovac, October, 20-21, 2023.

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PERVIOUS CONCRETE PAVEMENTS: THE INFLUENCE OF SOLIDIFIED WASTEWATER TREATMENT SLUDGE AS A SUPPLEMENTARY CEMENTITIOUS MATERIAL ON PAVEMENT POROSITY

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Permeable/pervious paving with waste and recycled materials represent a sustainable urban drainage technique resilient to pluvial flooding by storm-water runoff that also meets the terms of circular economy. Solidified wastewater treatment sludge was used as a supplementary cementitious material for the production of lightweight pervious concrete pavers that comply with EU standards. A detailed characterization of solidified wastewater treatment sludge (XRD, XRF, particle size and particle size distribution) has been performed showing that sample consisted dominantly of calcium hydroxide crystalline phase with additional minor crystalline phase that can be attributed to the CaCO₃ calcite phase. Four series of samples of lightweight pervious concrete pavers were produced, one reference mixture, and three mixtures where cement was replaced by 10, 20 and 30 mass%. Pore size distribution and porosity of pervious concrete pavers was analyzed by Mercury intrusion porosimetry. All studied samples had similar porosity and pore size distribution with the porosity in the range from 34.85 to 37.65%, whereas the cumulative pore volume ranged from 0.2451 to 0.2761 cm³/g, with multimodal and wide pore size distribution (predominant fraction of pores in diameter a range from 0.012 to 1 μm). These pore sizes are in accordance with the results measured on ordinary pervious concrete. The research showed that solidified wastewater treatment sludge is suitable for the partial replacement of cement in lightweight pervious concrete pavers, regarding the paver porosity. Nevertheless, further detailed study of other functional properties is necessary.