

ENVIRONMENTALLY FRIENDLY IMMOBILIZATION OF RADIOACTIVE WASTES IN AN ALKALI ACTIVATED CEMENT MATRIX

Pavel Krivenko, Scientific Research Institute for Binders and Materials, Kyiv National University of Construction and Architecture, Ukraine
pavlo.krivenko@gmail.com

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The paper presents data on efficiency of immobilization of low level radioactive wastes of nuclear power stations using the alkali activated cements as a binding agent in comparison with Portland cement. Much higher efficiency of the alkali activated cements is attributed to abilities of the alkali activated cement matrix, on the contrary to the Portland cement one, to bind radioactive nuclides not only physically and adsorptionally, but chemically. As a result of specific features of the alkali activated cement hardening processes the conditions occur, under which the zeolite-like phases (analogues to natural zeolites) with the crystalline lattices in which Cs and Cr can be disposed, to form, for example, Na-Sr-analcime – wairakite, Na-Cs-analcime – pollucite, gismondine (with the higher adsorption capacity) occur. Compositions of the alkali activated cements and those of the final products using real nitrate- and borate-containing wastes of various composition were chosen experimentally at the nuclear power stations after preliminary work with the waste imitators at the laboratory. Properties of the final products, these were: leachability, biological resistance, freeze/thaw resistance, water resistance, strength, were tested and the results are discussed. A conclusion was made that all above properties of the final products in which the alkali activated cements were used were at least by 10–20 % higher than those of similar products made using Portland cement, and in leachability (leach rate) exceeded by 5–10 times.

The paper also includes description of solidification processes used at the nuclear power plants with using of alkali activated cements.