Neutron-shielding Al–B_4C coatings cold spraying from mechanical powder mixtures

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One of the urgent problems in the nuclear industry is the creation of new materials and coatings that provide radiation protection from thermal neutrons, which will make it possible to abandon the use of boron steels, which are extremely difficult and expensive to manufacture. In the present work, an experimental study of the properties of a composite neutron-absorbing Al–B_4C coating, formed using the method of cold spraying from a mechanical powder mixture of aluminum and boron carbide, was carried out. A series of coatings of different thickness was obtained with a boron carbide concentration of 23 vol % uniformly distributed in the metal matrix. The introduction of boron carbide particles into the aluminum matrix made it possible to increase the coating microhardness by about 1.5 times (from 46.3 to 71.6 $HV_0.3$). It was shown that coating with a thickness of about 1.7 mm is capable of absorbing up to 75% of neutron radiation, which is 14% more efficient than the currently used boron steel with a thickness of about 6 mm.