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Study for the obtainment of the W-Cu-Ni system composite applying powder metalurgy for use as a radiation shielding material for gamma ray attenuation.

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The metallic composite material of the tungsten-copper-nickel system (W-Cu-Ni) produced by powder metallurgy (P/M) presented has adequade characteristics to be an alternative material for gamma (?) radiation attenuation. Lead and depleted uranium are the materials commonly used for radiation atenuattion. They are materials with certain toxicity and aggressiveness to the environment. The W-Cu-Ni composites are non-toxic and do not present environmental risks. The tungsten, matrix metal of the composite, has as property its atomic density that is directly proportional to the electrons of its atoms important for the purpose of effects of radiation attenuation. For the preparation of the composite samples, the size of the metallic particles was determined and selected. In order to homogenize the metallic particle distribution and to reduce the average particle size, a ball mill was used for 12, 24 and 36 hours. After grinding, the particle size analysis presented the mean particle size of 12 ?m was observed. After the sintering step, in the micro-hardness tests an average of 303.3 HV was achieved for the composition W6Cu1Ni. To measure the absorption of radiation in the samples the classical scientific method of narrow beam geometry (NBG) experiments was employed. The gamma radiation source of cobalt-60 was selected to study the effects and adjustments on the values of the Half-Value Layer and (HLV) in the dimensions of the required shielding thickness. For unpublished composite sample W6Cu1Ni the HLV method indicated the necessity of 9.27 mm of thickness in the obtained density of 13.38 g.cm-3, superior to the density of lead (11,34 g.cm-3). As a comparative, database from the XCOM (NIST) were used and demostrating convergence between the simulated values of 9.15 mm and the experimental values obtained.