

Title (en)

FUEL ELEMENT FOR A FAST NEUTRON REACTOR (VARIANTS) AND A CLADDING FOR THE PRODUCTION THEREOF

Title (de)

BRENNSTOFFELEMENT FÜR EINEN SCHNELLEN NEUTRONENREAKTOR (VARIANTEN) UND MANTELUNG FÜR SEINE HERSTELLUNG

Title (fr)

UNITE DE COMBUSTIBLE POUR REACTEUR A NEUTRONS RAPIDES, ET GAINÉ PERMETTANT SA PREPARATION

Publication

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Application

EP 04793751 A 20041004

Priority

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Abstract (en)

The invention relates to nuclear engineering, specifically, to materials used in nuclear power. The technical objective of the invention is to create a fuel element for BN reactor and to fabricate a cladding for it that would feature the following properties: low level induced radio- activity and a higher rate of its decay after neutron exposure, high level resistance to embrittlement in the temperature range of 270-400°C under neutron irradiation and high level heat resistance at temperatures up to 700°C. The set up objective is resolved by fabricating a fuel cladding from martensitic - ferritic steel with its structure along a cladding length comprising at least two zones; with steel structure in the top zone of a fuel cladding providing higher heat resistance and higher resistance to low temperature irradiation embrittlement in the bottom zone. The set up objective is resolved by fabricating a fuel cladding from steel having the following ratio between its components, %mass: carbon - 0.10-0.2, silicon - 0.1-0.8, manganese - 0.5-2.0; chromium - 10.0-13.5; tungsten - 0.8-2.5; vanadium - 0.05-0.4; titanium - 0.05-0.4; boron - 0.001-0.008; cerium (and/or yttrium in total) - 0.001-0.10; zirconium - 0.05-0.2; tantalum - 0.05-0.2; nitrogen - 0.02-0.15; the balance is iron, at the ratio of the total content of vanadium, titanium, zirconium and tantalum to the total content of carbon and nitrogen from 2 to 9; with the steel structure along a cladding length consisting of at least two zones; with the steel structure in the top zone of a fuel cladding providing higher heat resistance and containing \pm -ferrite, γ -ferrite, sorbite, chromium carbides M 23 C 6 and M 6 C, carbides and carbonitrides of steel components (V, Ta, Ti, Zr, W and others) intermetallid of Fe 2 (W) type and the structure in the bottom zone providing higher resistance to low temperature irradiation embrittlement and consisting of sorbite, γ -ferrite, \pm -ferrite, residual austenite, carbides and carbonitrides of steel components (Cr, V, Ta, W and others); in this case large angle boundaries of grains are occupied by carbides M 23 C 6 and M 6 C and grains of both sorbite and γ -ferrite have only individual precipitates of carbides and carbonitrides VC, V(CN), Ti(CN) and Ta(CN) while the other elements (Fe, Mn, Mo, W, Si and others) enter into compositions of either complex carbides M 23 C 6 and M 6 C or solid solution FeCr.

IPC 8 full level

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Cited by

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