

Название публикации:

Novel Ni-Cr-C alloys with chromium carbide whiskers

Авторы:

Val'chuk, VP [1] ; Zmienko, DS [2] ; Kolesov, VV [3] ; Bokova-Sirosh, SN [4] ; Dolotova, TS [1] ; Mikhaylov, IA [5] ; Golberg, D [6] ; Chernozatonskii, LA [1,5]

[1] RAS, Emanuel Inst Biochem Phys, 4 Kosygin St, Moscow 119334, Russia

[2] Rosatom State Nucl Energy Corp, 24 Bolshaya Ordynka St, Moscow 119017, Russia

[3] RAS, Kotelnikov Inst Radio Engn & Elect, 11-7 Mokhovaya St, Moscow 125009, Russia

[4] Prokhorov Inst Phys, 38 Vavilov St, Moscow 117312, Russia

[5] Plekhanov RUE, Sci Sch Chem & Technol Mat, 36 Stremyanny Per, Moscow 117997, Russia

[6] Natl Inst Mat Sci, Namiki 1-1, Tsukuba, Ibaraki 3050044, Japan

Сведения об издании:

MATERIALS CHEMISTRY AND PHYSICS

Том: 213 Стр.: 191-197

DOI: 10.1016/j.matchemphys.2018.04.034

Опубликовано: JUL 1 2018

Тип документа: Article

Аннотация:

We study the phases forming in the Ni-Cr-C three-component system appearing during powder mixture baking at 1200-1300 degrees C followed by fast cooling under increasing the concentration of a graphitic component (up to 5 wt%). The resulting multiphase new alloys show distinctive crystalline Cr₃C₂ rods with 1-10 micrometer diameters. The whisker regions in alloys have an extremely high hardness from 2200 up to 3200 HV (comparable to the highest hardness of nano whiskers and coatings with the presence of chromium carbide nano-inclusions). We formulate a sol-gel chemistry mechanism of rod formation via carbon diffusion into Cr and Cr_xC_y through a softened Ni-C particle on the Cr particle and the top of growing whisker. It explains discovered correlation between whisker diameters and Ni-particle sizes. (C) 2018 Elsevier B.V. All rights reserved.

Ключевые слова:

Chromium carbide; Ni-Cr-C alloys; Scanning electron microscopy; X-ray microanalysis; Hardness