STUDY OF THE MICROSTRUCTURE IN REMELTED ZIRCALOY BY SYNCHROTRON DIFFRACTION LINE PROFILE ANALYSIS

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Palavras-chave: Warren-Averbach Method;X-ray Line Profile Analysis;Zircaloy

Resumo:

Zirconium alloys, especially those known as Zircaloys, are extensively used both as fuel cladding and as core parts in PWR nuclear reactors. These alloys composed basically of Zr, Sn and minor contents of other elements, present good mechanical and corrosion properties allied to low thermal neutron absorption. In this work X-Ray Diffraction Line Profile Analysis was applied to study mean crystallite sizes and RMS microstrains in Zircaloy ingots produced by VAR (vacuum arc remelting) of machining chips generated in the fabrication of nuclear fuel elements for the Brazilian power reactors. The VAR remelted samples were also submitted to heat treatments in order to study changes in the microstructure, resulting in “as cast”, “annealed” and “quenched” samples. The X-ray diffraction measurements were performed using synchrotron radiation at the Brazilian Synchrotron Light Source (LNLS). The XRD line broadening was corrected by the deconvolution of the instrumental breadth from the experimental one by the Stokes method, using Y_2O_3 as standard sample. The Fourier space method of Warren-Averbach was used to determine the mean crystallite sizes and RMS microstrains from the corrected XRD profile. The results show the influence of heat treatments on the microstructures of the studied samples.

Acknowledgements: The autors acknowledge to CNEN for the scholarship of R. U. Ichikawa and to LNLS (Project number: D10B - XPD 11833)