PACKAGE ID - 001260IBMPC00 DART

KWIC TITLE - Dispersion Analysis Research Tool

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LIMITATION CODE -UNL **AUDIENCE CODE -** UNL

COMPLETION DATE - 08/01/1995 **PUBLICATION DATE -** 08/01/1995

DESCRIPTION - The DART thermomechanical model, for the prediction of fission-product-induced swelling in aluminum dispersion fuels, calculates irradiation-induced fission gas bubbles as a function of fuel morphology. DART calculates the behavior of a rod, tube, or plate during closure of as-fabricated porosity, during which the fuel particle swelling is accommodated by the relatively soft aluminum matrix flowing into the existing porosity. The code also determines the subsequent macroscopic changes in rod diameter or plate/tube thickness caused by additional fuel deformation processes. In addition, a calculation for the effect of irradiation on the thermal conductivity of the dispersion fuel, and for fuel restructuring and swelling due to the aluminum fuel reaction, amorphization, and recrystallization is included.

PACKAGE CONTENTS - Media Directory; Software Abstract; Media includes Source Code, Sample Problem Input and Output Data;

SOURCE CODE INCLUDED? - Yes

MEDIA QUANTITY - 1 3.5 Diskette

METHOD OF SOLUTION - The fission gas swelling model is based on the mechanistic Steady-State and Transient-Gas Release And Swelling Subroutine (GRASS-SST). Algorithms are incorporated for calculating the densities of bubbles in each of a number of bubble-size classes. Each class is characterized by an average number of atoms per bubble, the value of which differs from that of the preceding size class by a constant multiplier. The number of size classes is a variable determined dynamically during a computer run. The DART mechanical analysis, addresses the mechanical behavior of both dispersion fuel plates and fuel rods. The model examines a system of spherical fuel particles surrounded by a large spherical shell of matrix material bonded to an outer shell of aluminum cladding. The approach treats the inner sphere as a mechanically deforming body and the spherical shell as perfectly plastic.

COMPUTER - IBM PC

OPERATING SYSTEMS - DOS, Unix

PROGRAMMING LANGUAGES - Fortran

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SOFTWARE LIMITATIONS - DART does not currently model the thermal performance of the fuel element (aside from the calculation of the thermal conductivity of the dispersion material). The DART model includes several assumptions. Among these are that no swelling of the aluminum matrix occurs during reactor operation, that the fuel particles are identical in size and have a uniform spherical shape. Particle-particle interactions are ignored, and no change in aluminum yield stress with respect to fluence takes place.

SOURCE CODE AVAILABLE (Y/N) - Y

RELATED SOFTWARE - GRASS-SST, a comprehensive mechanistic model for the prediction of fission-gas behavior in UO2-base fuels during steady-state and translent conditions, and FASTGRASS, a mechanistic model for the prediction of Xe, I, Cs, Te, Ba, and Sr release from nuclear fuel under normal and severe accident conditions.

HARDWARE REQS - Use on personal computer requires a math coprocessor.

TIME REQUIREMENTS - Run time is a function of the number of fuel nodes and bubble-size classes selected.

REFERENCES - Rest, J., The DART Dispersion Analysis Tool: A Mechanistic Model for Predicting Fission-Product-Induced Swelling of Aluminum Dispersion Fuels, ANL-95/36, August 1995.

ABSTRACT STATUS - Released AS IS 11/23/98

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EDB SUBJECT CATEGORIES -
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SPONSOR - DOE/ER

PACKAGE TYPE - AS - IS