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REACTOR PHYSICS STUDY OF ORGANIC MODERATED FLUIDIZED BED NUCLEAR REACTOR

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Abstract

The feasibility of an organic moderated and cooled fluidized bed nuclear reactor concept using slightly enriched uranium dioxide as fuel has been investigated by preliminary reactor physics steady state calculations. The computations are based on homogenized unit cell concept using diffusion theory. The investigation includes the parametric study of k-effective as a function of fluidized bed height for various enrichments, calandria tube diameters, tube thickness and eollapsed heights. Also these calcuiations have been compared with those for a reactor using light water as moderator and coolant. The results show the viability of the proposed concept.

INTRODUCTION

A nuclear reactor concept based on the existing knowledge and knowhow has been proposed by one of the authors[1]. This design utilizes the fluidized bed concept. Further development of this idea has been presented[2-3]. In this, cylindrical calendria had seven 25 cm diameter tubes which contained enriched uranium dioxide one cm spherical fuel pellets. These spherical pellets floated in light water coolant/moderator contained in tubes made of 2 cm thick zircaloy. The coolant flows upward through a bed of solid fuel pellets which are fluidized. The reactivity control is partially accomplished by the change in buckling through the control of coolant flow velocity. The fuel elements were made of 2.5% enriched uranium dioxide cladded by zircaloy-4. Refuelling is to be performed continuously and while the reactor is on power.