

加速器による原子炉

鈴木 健 訓

Accelerator Aided Nuclear Reactor

Takenori SUZUKI*

Abstract

In the future nuclear power may encounter serious problems of the shortage of nuclear fuels. In order to solve this problem, many advanced countries in nuclear engineering are trying to construct FBR (Fast Breeding Reactor) for breeding fissile materials from fertile materials. Often this common type of FBR is claimed because of the longer doubling time than 15 years. An accelerator aided nuclear reactor was studied once around 1950. Because of the cost of breeding and enrichment, it was abandoned until 1977. In the past decade, several merits of the accelerator breeding have been looked up again and many researches have been conducted at several institutions. One of reasons to reconsider the project is that we have enough technologies to build an accelerator for breeder and also enough knowledge of several different targets. Already, a few design studies have been completed. From these results, Thorium cycle has been suggested. This will be a new option for nuclear energy and also this will increase the energy security of the world.

1. Introduction

Nowadays, an accelerator aided nuclear reactor has been studied extensively in many countries. This paper is going to summarize the second part of my talk presented at the workshop on energy held at National Cheng-Kung University, Taiwan, 1984. The first part has appeared in this last Bulletin issued in Feb. 1985 as a title of Muon Catalyzed Nuclear Fusion⁽¹⁾.

The idea of energy production using an accelerator was proposed around 1950 in USA. The project aimed at converting natural Uranium into Pu-239 and enriched Uranium. After the technical studies, the project was abandoned in the middle of 50's, since the production cost did not meet the cost of production by reprocessing spent fuel from a reactor and the gaseous diffusion enrichment. After two decades since the project was closed, Information Meeting on Accelerator Breeding was held by DOE in 1977. Since then, many proposals for accelerator breeding have been discussed in conferences. Many summaries about this project have been published^(2~7) and in this work these publications will be referred.

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