

FOREWORD

The safe, reliable and economic operation of nuclear reactors depends upon the reliable operation of the reactor shutdown and regulation systems. In liquid metal cooled fast reactors (LMFRs), these consist of control assemblies, drive mechanisms, guide tubes and other structural components. The main element of the control assembly is the control rod, which consists of a neutron absorbing material and is (usually) clad in stainless steel. Neutron absorbing materials in development include the ceramic boron carbide and europium oxide. The current control assembly designs have worked well, but recent developments have shown that their lifetime in the core and reliability could be increased by design improvements.

Fast reactor R&D programmes in some countries reflect the effort to enhance the flexibility to manage plutonium stockpiles. Studies performed recently have demonstrated that using the natural absorber B_4C in combination with moderator $^{11}B_4C$ could improve the safety of fast reactors in the plutonium burner mode of operation.

Owing to improvements in the reliability of operation of reactivity shutdown and decay heat removal systems, core melting accidents are highly improbable. The first step to prevent core melting is to be able to shutdown the reactor under all probable circumstances. For advanced fast reactors there are two independent reactor shutdown systems: a primary conventional active system and a backup passive system. At present, there are many proposed passive systems for the insertion of control rods into the core.

The IWGFR (International Working Group on Fast Reactors) proposed that the IAEA organize a Technical Committee Meeting on absorber materials, control rods and designs of backup reactivity shutdown systems for breakeven cores and burner cores for reducing plutonium stockpiles, to review operational experience with absorber elements and control rods and the development of passive backup shutdown systems for advanced LMFRs.

This was the third IAEA meeting held on the subject of absorber materials and control rods for LMFRs. The other two meetings were held in Dimitrovgrad (1973) and Obninsk, (1983), in the Former Soviet Union.