

# SOLUTIONS OF SOME TRANSPORT PROBLEMS IN MOLECULAR AND PHONON TRANSPORT

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## ABSTRACT

Nuclear reactor fuel undergoes vast changes during its lifetime. The fuel generates heat energy while simultaneously suffering neutron bombardments and swelling/rupture due to fission product/gas migration, aggregation and buildup. Ingenious analyses, advances in materials processing, and design and testing have permitted the attainment of significant burn-ups ( $\sim 33$  GWd/MT). Problems associated with nuclear proliferation due to national/international political instabilities, dictate the need for new nuclear fuel analyses and designs that would lead to high ( $\sim 65$  GWd/MT) and ultra high ( $\sim 100$  GWd/MT) burn-ups. While such burnp-ups have been achieved in some test fuels, the utilization of new fuels in commercial reactors have been fraught with several unanticipated practical difficulties.