

# Nitrides as a nuclear fuel option

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## Abstract

Nitrides have been proposed to be a suitable material for fast neutronic systems from beginning of the development of nuclear fuel. Starting with the production of uranium nitride and sesquinitrides up to mixed plutonium uranium nitrides, today's developments are inert nitride matrix materials to burn plutonium or to transmute long-lived actinides in accelerator-driven sub-critical systems (ADS) or fast reactors (FR). Several authors proposed zirconium nitride as possible inert matrix material for this reason. Mixed zirconium nitrides can be fabricated by carbothermal nitridation of the oxides in a narrow temperature window. Obtaining high quality material with low carbon and oxygen content is still the major challenge. Producing mixed nitride fuels by special shaping methods, as for example direct coagulation casting or freeze drying, in comparison to conventional powder compaction enables to use this material in special shapes to optimise burn up. The history of nitride fuels at PSI will be shown up to today's CONFIRM project, dealing with plutonium zirconium nitride fuels.