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U-rich ceramics for Spent Fuel or Acidic ^{99}Mo Production ILW

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Spent fuel has long been unofficially classified as HLW which is cooled for a few years to allow the dissipation of short-lived fission products and then is to be contained in thick-walled Cu or carbon steel containers for deep repository disposal where it is argued that the containers will perform immobilisation for ~ 105 yr. However immobilisation assumes highly reducing conditions in which UO_2 is essentially unreactive and even water-soluble fission products will be contained. The only published engineered waste form for spent UO_2 fuel is synroc-F in which the U concentration is nearly 50 wt.% and the fission products are incorporated in resistate titanate mineral phases. We have tried to extend this concept by hot isostatic pressing glass-ceramics in which synroc-F constitutes the ceramic phase and the glass furnishes a second phase for fission product immobilisation and increases the general reactivity. We have also used the same approach for acidic ^{99}Mo production ILW.

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