

Battelle Number(s):

15446

Patent(s) Issued

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Available Technologies

Systems and Methods for Treating Nuclear Materials with NF₃

SUMMARY

Valuable and potentially valuable materials are contained in used nuclear fuel and other irradiated materials (such as nuclear fuel and medical isotopes) if they can be safely separated and recovered.

Researchers at PNNL have developed new systems and methods for treating nuclear and irradiated materials to produce volatile fluorides using nitrogen trifluoride (NF₃), which can be used to separate one material from another. This method employs variables -- such as the differences in the fluorination temperature and the volatility of different fluorides at different temperature -- to separate the various materials and convert (all that can be converted) into gases within a reaction chamber safely and effectively. The chart (above right) demonstrates the separation of uranium from (U, Pu) O₂ at temperatures of ~550 degrees Celsius using the NF₃-fluorination method.

ADVANTAGES

The advantages of these systems and methods include:

- * less hazardous fluorinating agent than other agents used or proposed for fluorination in the nuclear fuel cycle;
- * uses a single reagent rather than a two-step fluorination process, which is potentially more efficient.
- * valuable constituents such as uranium and plutonium can be recovered and used in fuel applications;
- * valuable fission products or fission products that can poison nuclear reactions can be extracted at controlled conditions;

RELATED LINKS

- » Thermal reactions of uranium metal, UO₂, U₃O₈, UF₄, and UO₂F₂ with NF₃ to produce UF₆

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http://www.sciencedirect.com/science?_ob=MIimg&_imagekey=B6TXN-4X7R879-1-F&_cdi=5595&_user=2741876&_pii=S0022311509007752&_origin=search&_coverDate=11%2F30%2F2009&_sk=996059997&view=c&wchp=dGLbVzW-zSkWA&md5=3c98af73e60dae35a77cd42e008bd2fd&ie=lsdarticle.pdf

Patents & Intellectual Property

- » Patent Publication #: WO 2010/014745

Technology Portfolio(s)

- » Radiochemical Processing

Potential Industry Applications

- » Energy & Utilities
- » Healthcare, Pharma, Biotech & Medical
- » Public Administration & Government

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