

## **KJRR, Medical Radioisotope Production Reactor**

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### **Abstract**

The medical application is one of the major benefits that can be expected from radiation. Radiation has been used as therapeutic and diagnostic tool such as Gamma knife and PET for many years. 80% of nuclear diagnosis is performed by Tc-99m using in SPECT. This most demanding medical radioisotope (RI) is produced during nuclear fission. Two of major Mo-99 (mother nucleus of Tc-99m) production research reactors had been shut down for half a year in 2008 and 2010. These two incidents induced global shortage of Tc-99m and a large number of cancer patients had to be in a long line for diagnosis. The failure of those research reactors was mainly due to the aging problem and furthermore several research reactors have announced the complete shutdown plan in the near future. In order to make up the shortage due to the shutdown of old reactors, new research reactors are under construction in France and Argentina. Last May, the KJRR (Kijang Research Reactor) received a construction permit. KJRR has a capability of 2,000 Ci/wk of Mo-99 which is 17% of world demand of 12,000 Ci/wk.

The KJRR will be using high density low enriched uranium molybdenum fuel, which is a first kind in the world. The high density low enriched U-Mo fuel is expected to replace existing low density high enriched uranium fuel contributing to nuclear non-proliferation. Furthermore, KAERI (Korea Atomic Energy Research Institute) is developing low enriched Moly target which could also replace existing high enriched Moly target. Mo-99 is not the only RI which KJRR will produce. I-129, I-131, Ir-192 will be produced for medical and industrial applications. More RI's including Lu-177 will be developed at the RI research center which will be established near KJRR and will be produced at KJRR.

Another feature of KJRR is that it is capable of producing 12 inch Si ingot. Si ingot produced in the nuclear reactor by neutron transmutation doping (NTD) has a higher quality compared to the one produced by a chemical processing and can be used as high current switch such as in hybrid cars and express trains. The demand of current Si ingot market is mainly 6 and 8 inch ingot and 12 inch ingot will be demanded in the near future.

**Keywords:** *medical radioisotope, Mo-99, research reactor, KJRR, NTD*

### **Biography**

KAERI (Korea Atomic Energy Research Institute)

Mr. Lee has thirty years of experience in research reactor area. He designed HANARO, a multi-purpose research reactor and designed the cold neutron source for the physics study of nano-scale material and polymers. Molybdenum-99 has been imported 100% and used for cancer diagnosis in the hospitals. An isotope production reactor is under construction at Kijang, Pusan. He served as an executive secretary of Kijang research reactor Project.