Update-9

Asim Anand

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1 Production of radionuclides

Radionuclides found in nature, such as uranium and radium, are heavy elements with high toxicity and long half-life (over 1,000 years), so they are not used clinically. Radionuclides used in nuclear medicine are artificially produced by neutron bombardment or nuclear fission.

Many radionuclides are produced in nuclear reactors and cyclotrons. Generally, neutron-rich radioisotopes and those resulting from nuclear fission are produced in reactors (Table 1) and the neutron-poor radioisotopes are produced in cyclotrons (Table 2). There are about 30 radioisotopes produced by activation and 5 are reactor melt products. A list with 70 elements, their isotopes, half-lives, decay, main energy and applications can be found in the reference.

Table 1. 30 selected radionuclides produced by nuclear fission[14].

^{213}bismuth	^{59}iron	^{153}samarium
^{131}caesium	^{212}lead	^{75}selenium
^{137}caesium	^{177}lutetium	^{24}sodium
^{51}chromium	^{99}molybdenum	^{89}strontium
^{60}cobalt-60	^{103}palladium	^{99m}technetium
^{165}dysprosium	^{32}phosphorus	^{227}thorium
^{169}erbium	^{42}potassium	^{133}xenon
^{166}holmium	^{223}radium	^{169}ytterbium
^{131}iodine	^{186}rhenium	^{177}ytterbium
^{192}iridium	^{188}rhenium	^{90}yttrium

Table 2. 18 selected radionuclides produced by cyclotrons[14].

^{225}actinium	^{67}copper
^{211}astatine	^{67}gallium
^{213}bismuth	^{127}xenon
^{11}carbon	^{111}indium
^{13}nitrogen	^{123}iodine
^{15}oxygen	^{124}iodine
^{18}fluorine	^{81m}krypton
^{57}cobalt	^{82}rubidium
^{64}copper	^{201}thallium

Figure 1: Image