Table 1. Nuclear spectroscopic data and yields of fission products in the 6.35 MeV neutron-induced fission of 238U

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray  abundance (%) | *YC* (%) | *YA* (%) |
| 84Br  85Krm  87Kr  88Kr  91Sr  92Sr  93Y  95Zr  97Zr  99Mo  103Ru  105Ru  105Rh  112Ag  113Ag  115Cdg  115Cdtotal  117Cdm  117Cdg  117Cdtotal | 31.8 min  4.48 h  76.3 min  2.84 h  9.63 h  2.71 h  10.18 h  64.02 d  16.91 h  65.94 h  39.26 d  4.44 h  35.36 h  3.13 h  5.37 h  53.46 h  3.36 h  2.49 h | 1616.2  151.2  304.9  402.6  196.3  749.8  1024.3  1384.9  266.9  756.7  724.3  743.4  140.5  739.5  497.1  724.4  319.1  617.5  298.6  336.2  1066.0  1097.3  273.4 | 6.2  75.0  14.0  49.6  25.9  23.6  33.0  90.0  7.3  54.0  44.2  93.0  89.4  12.13  90.0  47.0  19.2  43.0  10.0  45.9  23.1  26.0  28.0 | 0.642±0.044  0.937±0.042  0.932±0.052  1.680±0.136  2.063±0.165  3.352±0.268  3.419±0.307  3.630±0.253  3.301±0.226  5.324±0.287  5.056±0.307  6.218±0.353  5.041±0.258  5.733±0.239  5.962±0.209  3.370±0.232  3.429±0.214  0.307±0.078  0.221±0.024  0.122±0.019  0.143±0.019\*  0.033±0.009  0.037±0.009  0.099±0.014  0.134±0.014 | 0.643±0.044  0.937±0.042  0.932±0.052  1.685±0.137  2.090±0.167  3.352±0.268  3.419±0.307  3.634±0.253  3.301±0.226  5.324±0.287  5.056±0.307  6.224±0.353  5.041±0.258  5.733±0.239  5.962±0.209  3.390±0.234  3.429±0.214  0.307±0.078  0.221±0.024    0.143±0.019\*  0.134±0.014 |

\*The yields of 115Cdtotal is based on the ratio of 115Cdg/115Cdm =6 from Ref. [25]

Table 1. –continued

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray abundance (%) | *YC* (%) | *YA* (%) |
| 127Sb  128Sn  129Sb  131I  132Te  133I  134Te  134I  135I  138Csg  139Ba  140Ba  141Ce  142La  143Ce  144Ce  147Nd  149Nd  151Pm  153Sm | 3.85 d  59.07 min  4.32 h  8.02 d  3.2 d  20.8 h  41.8 min  52.5 m  6.57 h  33.41 min  83.03 min  12.75 d  32.5 d  91.1 min  33.03 h  284.89 d  10.98 d  1.728 h  28.4 h  46.28 h | 687.0  482.3  812.4  364.5  228.1  529.9  566.0  767.2  847.03  884.09  1131.5  1260.4  1435.8  1009.8  462.8  165.8  537.3  145.4  641.3  293.3  133.5  531.0  211.3  270.2  340.8  103.2 | 37.0  59.0  43.0  81.7  88.0  87.0  18.0  29.5  95.9  65.0  22.7  28.9  76.3  29.8  30.7  23.7  24.4  48.0  47.0  42.8  11.09  13.1  25.9  10.6  23.0  30.0 | 0.594±0.078  0.780±0.056  1.315±0.107  2.840±0.239  5.341±0.320  6.337±0.309  7.004±0.351  6.841±0.357  7.715±0.323  7.836±0.333  5.509±0.305  5.427±0.285  6.615±0.331  7.078±0.346  7.112±0.356  7.107±0.273  6.561±0.214  5.967±0.209  4.559±0.273  4.983±0.297  5.188±0.351  3.663±0.217  2.307±0.155  2.226±0.108  1.166±0.103  0.439±0.029 | 0.594±0.078  0.818±0.058  1.320±0.107  2.840±0.239  5.368±0.321  6.337±0.309  7.556±0.378  7.380±0.385  7.730±0.223  7.836±0.333  5.548±0.307  5.465±0.287  6.615±0.331  7.078±0.346  7.112±0.356  7.107±0.273  6.561±0.214  5.967±0.209  4.559±0.273  4.983±0.297  5.188±0.351  3.663±0.217  2.316±0.156  2.226±0.108  1.168±0.104  0.439±0.032 |

*YC* – Cumulative yields, *YA* – Mass yields, 135I – Fission rate monitor.

Table 2. Nuclear spectroscopic data and yields of fission products in the 8.53 MeV neutron-induced fission of 238U

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray  abundance (%) | *YC* (%) | *YA* (%) |
| 84Br  85Krm  87Kr  88Kr  91Sr  92Sr  93Y  95Zr  97Zr  99Mo  103Ru  105Ru  105Rh  112Ag  113Ag  115Cdg  115Cdtotal  117Cdm  117Cdg  117Cdtotal | 31.8 min  4.48 h  76.3 min  2.84 h  9.63 h  2.71 h  10.18 h  64.02 d  16.91 h  65.94 h  39.26 d  4.44 h  35.36 h  3.13 h  5.37 h  53.46 h  3.36 h  2.49 h | 1616.2  151.2  304.9  402.6  196.3  749.8  1024.3  1384.9  266.9  756.7  724.3  743.4  140.5  739.5  497.1  724.4  319.1  617.5  298.6  336.2  1066.0  1097.3  273.4 | 6.2  75.0  14.0  49.6  25.9  23.6  33.0  90.0  7.3  54.0  44.2  93.0  89.4  12.13  90.0  47.0  19.2  43.0  10.0  45.9  23.1  26.0  28.0 | 0.641±0.038  0.954±0.042  0.963±0.056  1.614±0.153  2.199±0.142  3.763±0.265  3.647±0.172  3.915±0.312  3.766±0.360  4.731±0.283  5.077±0.274  6.170±0.345  5.202±0.125  5.547±0.139  5.278±0.221  3.423±0.234  3.497±0.245  0.389±0.034  0.330±0.028  0.214±0.033  0.247±0.033\*  0.065±0.014  0.056±0.014  0.177±0.023  0.237±0.028 | 0.642±0.038  0.954±0.042  0.963±0.056  1.619±0.153  2.228±0.144  3.763±0.265  3.647±0.172  3.919±0.312  3.766±0.360  4.731±0.283  5.077±0.274  6.177±0.346  5.202±0.125  5.547±0.139  5.278±0.221  3.444±0.235  3.497±0.245  0.389±0.034  0.330±0.028    0.247±0.033\*  0.237±0.028 |

\*The yields of 115Cdtotal is based on the ratio of 115Cdg/115Cdm =6 from Ref. [25]

Table 2. –continued

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray abundance (%) | *YC* (%) | *YA* (%) |
| 127Sb  128Sn  129Sb  131I  132Te  133I  134Te  134I  135I  138Csg  139Ba  140Ba  141Ce  142La  143Ce  144Ce  147Nd  149Nd  151Pm  153Sm | 3.85 d  59.07 min  4.32 h  8.02 d  3.2 d  20.8 h  41.8 min  52.5 m  6.57 h  33.41 min  83.03 min  12.75 d  32.5 d  91.1 min  33.03 h  284.89 d  10.98 d  1.728 h  28.4 h  46.28 h | 687.0  482.3  812.4  364.5  228.1  529.9  566.0  767.2  847.03  884.09  1131.5  1260.4  1435.8  1009.8  462.8  165.8  537.3  145.4  641.3  293.3  133.5  531.0  211.3  270.2  340.8  103.2 | 37.0  59.0  43.0  81.7  88.0  87.0  18.0  29.5  95.9  65.0  22.7  20.3  76.3  29.8  30.7  23.7  35.4  20.5  47.0  42.8  11.09  13.1  25.9  10.6  23.0  30.0 | 0.777±0.072  1.077±0.087  1.713±0.153  2.949±0.341  5.085±0.354  6.340±0.235  6.844±0.343  7.093±0.352  7.444±0.312  7.459±0.254  5.327±0.176  5.294±0.243  5.658±0.283  5.879±0.293  6.071±0.303  6.426±0.293  6.042±0.216  5.317±0.235  4.385±0.173  4.635±0.202  5.086±0.211  3.751±0.183  2.229±0.201  2.291±0.120  1.166±0.098  0.394±0.031 | 0.778±0.072  1.129±0.091  1.719±0.154  2.949±0.341  5.111±0.355  6.340±0.235  7.375±0.370  7.644±0.379  7.459±0.312  7.473±0.255  5.365±0.178  5.331±0.245  5.658±0.283  5.879±0.293  6.071±0.303  6.426±0.293  6.042±0.216  5.317±0.235  4.385±0.173  4.635±0.202  5.086±0.211  3.751±0.183  2.238±0.202  2.301±0.120  1.168±0.098  0.434±0.034 |

*YC* – Cumulative yields, *YA* – Mass yields, 135I – Fission rate monitor.

Table 3. Nuclear spectroscopic data and yields of fission products in the 9.35 MeV neutron-induced fission of 238U

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray  abundance (%) | *YC* (%) | *YA* (%) |
| 84Br  85Krm  87Kr  88Kr  91Sr  92Sr  93Y  95Zr  97Zr  99Mo  103Ru  105Ru  105Rh  112Ag  113Ag  115Cdg  115Cdtotal  117Cdm  117Cdg  117Cdtotal | 31.8 min  4.48 h  76.3 min  2.84 h  9.63 h  2.71 h  10.18 h  64.02 d  16.91 h  65.94 h  39.26 d  4.44 h  35.36 h  3.13 h  5.37 h  53.46 h  3.36 h  2.49 h | 1616.2  151.2  304.9  402.6  196.3  749.8  1024.3  1384.9  266.9  756.7  724.3  743.4  140.5  739.5  497.1  724.4  319.1  617.5  298.6  336.2  1066.0  1097.3  273.4 | 6.2  75.0  14.0  49.6  25.9  23.6  33.0  90.0  7.3  54.0  44.2  93.0  89.4  12.13  90.0  47.0  19.2  43.0  10.0  45.9  23.1  26.0  28.0 | 0.664±0.042  1.067±0.062  1.076±0.085  1.962±0.120  2.361±0.150  3.898±0.282  3.699±0.249  4.318±0.254  3.898±0.272  4.733±0.194  5.380±0.240  6.191±0.203  5.226±0.152  5.449±0.245  5.763±0.254  3.401±0.290  3.496±0.245  0.439±0.051  0.328±0.032  0.237±0.027  0.277±0.027\*  0.065±0.009  0.074±0.014  0.196±0.031  0.267±0.036 | 0.665±0.042  1.067±0.062  1.076±0.085  1.968±0.121  2.392±0.152  3.898±0.282  3.699±0.249  4.322±0.254  3.898±0.272  4.733±0.194  5.380±0.240  6.197±0.203  5.226±0.152  5.449±0.245  5.763±0.254  3.408±0.291  3.496±0.245  0.439±0.051  0.328±0.032  0.277±0.027\*  0.267±0.036 |

\*The yields of 115Cdtotal is based on the ratio of 115Cdg/115Cdm =6 from Ref. [25]

Table 3. –continued

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray abundance (%) | *YC* (%) | *YA* (%) |
| 127Sb  128Sn  129Sb  131I  132Te  133I  134Te  134I  135I  138Csg  139Ba  140Ba  141Ce  142La  143Ce  144Ce  147Nd  149Nd  151Pm  153Sm | 3.85 d  59.07 min  4.32 h  8.02 d  3.2 d  20.8 h  41.8 min  52.5 m  6.57 h  33.41 min  83.03 min  12.75 d  32.5 d  91.1 min  33.03 h  284.89 d  10.98 d  1.728 h  28.4 h  46.28 h | 687.0  482.3  812.4  364.5  228.1  529.9  566.0  767.2  847.03  884.09  1131.5  1260.4  1435.8  1009.8  462.8  165.8  537.3  145.4  641.3  293.3  133.5  531.0  211.3  270.2  340.8  103.2 | 37.0  59.0  43.0  81.7  88.0  87.0  18.0  29.5  95.9  65.0  22.7  28.9  76.3  29.8  30.7  23.7  24.4  48.0  47.0  42.8  11.09  13.1  25.9  10.6  23.0  30.0 | 0.780±0.065  1.123±0.079  1.421±0.083  3.177±0.222  4.765±0.285  6.174±0.240  6.401±0.192  6.727±0.232  7.107±0.249  6.876±0.207  5.397±0.252  5.150±0.206  5.833±0.291  5.620±0.282  5.990±0.301  5.990±0.222  5.768±0.199  5.348±0.208  4.909±0.157  5.283±0.203  5.426±0.217  3.376±0.236  2.240±0.129  2.343±0.102  1.201±0.129  0.418±0.038 | 0.780±0.065  1.178±0.083  1.427±0.083  3.177±0.222  4.789±0.286  6.174±0.240  6.890±0.212  7.241±0.249  7.121±0.249  6.890±0.208  5.435±0.254  5.186±0.208  5.833±0.291  5.620±0.282  5.990±0.301  5.990±0.222  5.768±0.199  5.348±0.208  4.909±0.157  5.283±0.203  5.426±0.217  3.376±0.236  2.249±0.129  2.352±0.103  1.206±0.129  0.460±0.041 |

*YR* – Cumulative yields, *YA* – Mass yields, 135I – Fission rate monitor.

Table 4. Nuclear spectroscopic data and yields of fission products in the 12.52 MeV neutron-induced fission of 238U

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray Energy  (keV) | γ-ray abundance (%) | *YC* (%) | *YA* (%) |
| 84Br  85Krm  87Kr  88Kr  91Sr  92Sr  93Y  95Zr  97Zr  99Mo  103Ru  105Ru  105Rh  112Ag  113Ag  115Cdg  115Cdtotal  117Cdm  117Cdg  117Cdtotal | 31.8 min  4.48 h  76.3 min  2.84 h  9.63 h  2.71 h  10.18 h  64.02 d  16.91 h  65.94 h  39.26 d  4.44 h  35.36 h  3.13 h  5.37 h  53.46 h  3.36 h  2.49 h | 1616.2  151.2  304.9  402.6  196.3  749.8  1024.3  1384.9  266.9  756.7  724.3  743.4  140.5  739.5  497.1  724.4  319.1  617.5  298.6  336.2  1066.0  1097.3  273.4 | 6.2  75.0  14.0  49.6  25.9  23.6  33.0  90.0  7.3  54.0  44.2  93.0  89.4  12.13  90.0  47.0  19.2  43.0  10.0  45.9  23.1  26.0  28.0 | 0.695±0.041  1.171±0.095  1.192±0.095  2.191±0.108  2.788±0.145  3.451±0.211  3.836±0.153  4.312±0.211  3.702±0.162  5.057±0.220  5.290±0.197  5.899±0.220  4.644±0.188  5106±0.260  5.842±0.184  3.309±0.206  3.486±0.242  0.615±0.049  0.524±0.040  0.431±0.039  0.503±0.039\*  0.126±0.013  0.117±0.018  0.354±0.031  0.476±0.036 | 0.696±0.041  1.171±0.095  1.192±0.095  2.195±0.108  2.822±0.147  3.451±0.211  3.836±0.153  4.316±0.211  3.701±0.162  5.057±0.220  5.290±0.197  5.905±0.220  4.644±0.188  5.106±0.260  5.842±0.184  3.316±0.206  3.486±0.242  0.615±0.049  0.525±0.040  0.503±0.039\*  0.476±0.036 |

\*The yields of 115Cdtotal is based on the ratio of 115Cdg/115Cdm =6 from Ref. [25]

Table 4. –continued

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Nuclide | Half-life | γ-ray  Energy(keV) | γ-ray abundance (%) | *YC* (%) | *YA* (%) |
| 127Sb  128Sn  129Sb  131I  132Te  133I  134Te  134I  135I  138Csg  139Ba  140Ba  141Ce  142La  143Ce  144Ce  147Nd  149Nd  151Pm  153Sm | 3.85 d  59.07 min  4.32 h  8.02 d  3.2 d  20.8 h  41.8 min  52.5 m  6.57 h  33.41 min  83.03 min  12.75 d  32.5 d  91.1 min  33.03 h  284.89 d  10.98 d  1.728 h  28.4 h  46.28 h | 687.0  482.3  812.4  364.5  228.1  529.9  566.0  767.2  847.03  884.09  1131.5  1260.4  1435.8  1009.8  462.8  165.8  537.3  145.4  641.3  293.3  133.5  531.0  211.3  270.2  340.8  103.2 | 37.0  59.0  43.0  81.7  88.0  87.0  18.0  29.5  95.9  65.0  22.7  28.9  76.3  29.8  30.7  23.7  24.4  48.0  47.0  42.8  11.09  13.1  25.9  10.6  23.0  30.0 | 0.843±0.067  1.251±0.099  1.667±0.197  3.639±0.265  4.853±0.254  5.748±0.193  6.005±0.271  6.247±0.225  6.950±0.219  6.704±0.215  5.062±0.209  4.946±0.203  5.465±0.238  6.246±0.197  6.084±0.188  5.788±0.238  5.568±0.197  5.120±0.220  4.631±0.188  4.918±0.206  5.079±0.242  3.101±0.157  2.114±0.170  2.117±0.207  1.185±0.052  0.382±0.028 | 0.844±0.067  1.310±0.099  1.674±0.197  3.639±0.265  4.877±0.256  5.748±0.193  6.457±0.288  6.717±0.242  6.964±0.220  6.717±0.215  5.097±0.211  4.981±0.206  5.465±0.238  6.246±0.197  6.084±0.188  5.788±0.238  5.568±0.197  5.120±0.220  4.631±0.188  4.918±0.206  5.079±0.242  3.101±0.157  2.118±0.171  2.126±0.207  1.188±0.052  0.422±0.031 |

*YC* – Cumulative yields, *YA* – Mass yields, 135I – Fission rate monitor.