

**POZIOMY PROGOWE AKTYWNOŚCI ORAZ STĘŻENIA PROMIENIOTWÓRCZEGO
IZOTOPÓW PROMIENIOTWÓRCZYCH**

| Izotop promieniotwórczy | Aktywność (Bq) P ₁ | Aktywność (Bq) P ₂ | Stężenie promieniotwórcze (kBq/kg) |
|-------------------------|----------------------------------|----------------------------------|------------------------------------|
| 1 | 2 | 3 | 4 |
| H-3 | 10 ⁹ | 4 x 10 ¹¹ | 10 ⁶ |
| Be-7 | 10 ⁷ | 2 x 10 ¹¹ | 10 ³ |
| C-14 | 10 ⁷ | 4 x 10 ¹¹ | 10 ⁴ |
| O-15 | 10 ⁹ | | 10 ² |
| F-18 | 10 ⁶ | 10 ¹⁰ | 10 |
| Na-22 | 10 ⁶ | 5 x 10 ⁹ | 10 |
| Na-24 | 10 ⁵ | 2 x 10 ⁹ | 10 |
| Si-31 | 10 ⁶ | 6 x 10 ⁹ | 10 ³ |
| P-32 | 10 ⁵ | 5 x 10 ⁹ | 10 ³ |
| P-33 | 10 ⁸ | 4 x 10 ¹¹ | 10 ⁵ |
| S-35 | 10 ⁸ | 4 x 10 ¹¹ | 10 ⁵ |
| Cl-36 | 10 ⁶ | 10 ¹¹ | 10 ⁴ |
| Cl-38 | 10 ⁵ | 2 x 10 ⁹ | 10 |
| Ar-37 | 10 ⁸ | 4 x 10 ¹¹ | 10 ⁶ |
| Ar-41 | 10 ⁹ | 3 x 10 ⁹ | 10 ² |
| K-40 | 10 ⁶ | 9 x 10 ⁹ | 10 ² |
| K-42 | 10 ⁶ | 2 x 10 ⁹ | 10 ² |
| K-43 | 10 ⁶ | 7 x 10 ⁹ | 10 |
| Ca-45 | 10 ⁷ | 4 x 10 ¹¹ | 10 ⁴ |
| Ca-47 | 10 ⁶ | 3 x 10 ¹⁰ | 10 |
| Sc-46 | 10 ⁶ | 5 x 10 ⁹ | 10 |
| Sc-47 | 10 ⁶ | 10 ¹¹ | 10 ² |
| Sc-48 | 10 ⁵ | 3 x 10 ⁹ | 10 |
| V-48 | 10 ⁵ | 4 x 10 ⁹ | 10 |
| Cr-51 | 10 ⁷ | 3 x 10 ¹¹ | 10 ³ |
| Mn-51 | 10 ⁵ | | 10 |
| Mn-52 | 10 ⁵ | 3 x 10 ⁹ | 10 |
| Mn-52m | 10 ⁵ | | 10 |
| Mn-53 | 10 ⁹ | | 10 ⁴ |
| Mn-54 | 10 ⁶ | 10 ¹⁰ | 10 |
| Mn-56 | 10 ⁵ | 3 x 10 ⁹ | 10 |
| Fe-52 | 10 ⁶ | 3 x 10 ⁹ | 10 |
| Fe-55 | 10 ⁶ | 4 x 10 ¹¹ | 10 ⁴ |
| Fe-59 | 10 ⁶ | 9 x 10 ⁹ | 10 |
| Co-55 | 10 ⁶ | 5 x 10 ⁹ | 10 |

| 1 | 2 | 3 | 4 |
|--------|-----------|--------------------|--------|
| Co-56 | 10^5 | 3×10^9 | 10 |
| Co-57 | 10^6 | 10^{11} | 10^2 |
| Co-58 | 10^6 | 10^{10} | 10 |
| Co-58m | 10^7 | 4×10^{11} | 10^4 |
| Co-60 | 10^5 | 4×10^9 | 10 |
| Co-60m | 10^6 | | 10^3 |
| Co-61 | 10^6 | | 10^2 |
| Co-62m | 10^5 | | 10 |
| Ni-59 | 10^8 | | 10^4 |
| Ni-63 | 10^8 | 4×10^{11} | 10^5 |
| Ni-65 | 10^6 | 4×10^9 | 10 |
| Cu-64 | 10^6 | 6×10^{10} | 10^2 |
| Zn-65 | 10^6 | 2×10^{10} | 10 |
| Zn-69 | 10^6 | 3×10^{10} | 10^4 |
| Zn-69m | 10^6 | 3×10^{10} | 10^2 |
| Ga-72 | 10^5 | 4×10^9 | 10 |
| Ge-71 | 10^8 | 4×10^{11} | 10^4 |
| As-73 | 10^7 | 4×10^{11} | 10^3 |
| As-74 | 10^6 | 10^{10} | 10 |
| As-76 | 10^5 | 3×10^9 | 10^2 |
| As-77 | 10^6 | 2×10^{11} | 10^3 |
| Se-75 | 10^6 | 3×10^{10} | 10^2 |
| Br-82 | 10^6 | 4×10^9 | 10 |
| Kr-74 | 10^9 | | 10^2 |
| Kr-76 | 10^9 | | 10^2 |
| Kr-77 | 10^9 | | 10^2 |
| Kr-79 | 10^5 | | 10^3 |
| Kr-81 | 10^7 | 4×10^{11} | 10^4 |
| Kr-83m | 10^{12} | | 10^5 |
| Kr-85 | 10^4 | 10^{11} | 10^5 |
| Kr-85m | 10^{10} | 8×10^{10} | 10^3 |
| Kr-87 | 10^9 | 2×10^9 | 10^2 |
| Kr-88 | 10^9 | | 10^2 |
| Rb-86 | 10^5 | 5×10^9 | 10^2 |
| Sr-85 | 10^6 | 2×10^{10} | 10^2 |
| Sr-85m | 10^7 | 5×10^{10} | 10^2 |
| Sr-87m | 10^6 | 3×10^{10} | 10^2 |
| Sr-89 | 10^6 | 6×10^9 | 10^3 |
| Sr-90+ | 10^4 | $3 \times 10^9(a)$ | 10^2 |
| Sr-91 | 10^5 | 3×10^9 | 10 |
| Sr-92 | 10^6 | 10^{10} | 10 |

| 1 | 2 | 3 | 4 |
|----------|--------|-----------------------|--------|
| Y-90 | 10^5 | 3×10^9 | 10^3 |
| Y-91 | 10^6 | 6×10^9 | 10^3 |
| Y-91m | 10^6 | 2×10^{10} | 10^2 |
| Y-92 | 10^5 | 2×10^9 | 10^2 |
| Y-93 | 10^5 | 3×10^9 | 10^2 |
| Zr-93+ | 10^7 | | 10^3 |
| Zr-95 | 10^6 | 2×10^{10} | 10 |
| Zr-97+ | 10^5 | 4×10^9 | 10 |
| Nb-93m | 10^7 | 4×10^{11} | 10^4 |
| Nb-94 | 10^6 | 7×10^9 | 10 |
| Nb-95 | 10^6 | 10^{10} | 10 |
| Nb-97 | 10^6 | 9×10^9 | 10 |
| Nb-98 | 10^5 | | 10 |
| Mo-90 | 10^6 | | 10 |
| Mo-93 | 10^8 | 4×10^{11} | 10^3 |
| Mo-99 | 10^6 | 10^{10} | 10^2 |
| Mo-101 | 10^6 | | 10 |
| Tc-96 | 10^6 | 4×10^9 | 10 |
| Tc-96m | 10^7 | 4×10^9 | 10^3 |
| Tc-97 | 10^8 | | 10^3 |
| Tc-97m | 10^7 | 4×10^{11} | 10^3 |
| Tc-99 | 10^7 | 4×10^{11} | 10^4 |
| Tc-99m | 10^7 | 10^{11} | 10^2 |
| Ru-97 | 10^7 | 5×10^{10} | 10^2 |
| Ru-103 | 10^6 | 2×10^{10} | 10^2 |
| Ru-105 | 10^6 | 10^{10} | 10 |
| Ru-106+ | 10^5 | 2×10^9 | 10^2 |
| Rh-103m | 10^8 | 4×10^{11} | 10^4 |
| Rh-105 | 10^7 | 10^{11} | 10^2 |
| Pd-103 | 10^8 | $4 \times 10^{11}(a)$ | 10^3 |
| Pd-109 | 10^6 | 2×10^{10} | 10^3 |
| Ag-105 | 10^6 | 2×10^{10} | 10^2 |
| Ag-108m+ | 10^6 | 7×10^9 | 10 |
| Ag-110m | 10^6 | 4×10^9 | 10 |
| Ag-111 | 10^6 | 2×10^{10} | 10^3 |
| Cd-109 | 10^6 | 3×10^{11} | 10^4 |
| Cd-115 | 10^6 | 3×10^{10} | 10^2 |
| Cd-115m | 10^6 | 5×10^9 | 10^3 |
| In-111 | 10^6 | 3×10^{10} | 10^2 |
| In-113m | 10^6 | 4×10^{10} | 10^2 |
| In-114m | 10^6 | 10^{11} | 10^2 |

| 1 | 2 | 3 | 4 |
|---------|-----------|-----------------------|--------|
| In-115m | 10^6 | 7×10^{10} | 10^2 |
| Sn-113 | 10^7 | 4×10^{10} | 10^3 |
| Sn-125 | 10^5 | 4×10^9 | 10^2 |
| Sb-122 | 10^4 | 4×10^9 | 10^2 |
| Sb-124 | 10^6 | 6×10^9 | 10 |
| Sb-125 | 10^6 | 2×10^{10} | 10^2 |
| Te-123m | 10^7 | 8×10^{10} | 10^2 |
| Te-125m | 10^7 | 2×10^{11} | 10^2 |
| Te-127 | 10^6 | 2×10^{11} | 10^3 |
| Te-127m | 10^7 | 2×10^{11} | 10^3 |
| Te-129 | 10^6 | 7×10^9 | 10^2 |
| Te-129m | 10^6 | 8×10^9 | 10^3 |
| Te-131 | 10^5 | | 10^2 |
| Te-131m | 10^6 | 7×10^9 | 10 |
| Te-132 | 10^7 | 5×10^9 | 10^2 |
| Te-133 | 10^5 | | 10 |
| Te-133m | 10^5 | | 10 |
| Te-134 | 10^6 | | 10 |
| I-123 | 10^7 | 6×10^{10} | 10^2 |
| I-125 | 10^6 | 2×10^{11} | 10^3 |
| I-126 | 10^6 | 2×10^{10} | 10^2 |
| I-129 | 10^5 | | 10^2 |
| I-130 | 10^6 | | 10 |
| I-131 | 10^6 | 3×10^{10} | 10^2 |
| I-132 | 10^5 | 4×10^9 | 10 |
| I-133 | 10^6 | 7×10^9 | 10 |
| I-134 | 10^5 | 3×10^9 | 10 |
| I-135 | 10^6 | 6×10^9 | 10 |
| Xe-131m | 10^4 | 4×10^{11} | 10^4 |
| Xe-133 | 10^4 | 2×10^{11} | 10^3 |
| Xe-135 | 10^{10} | 3×10^{10} | 10^3 |
| Cs-129 | 10^5 | 4×10^{10} | 10^2 |
| Cs-131 | 10^6 | 3×10^{11} | 10^3 |
| Cs-132 | 10^5 | 10^{10} | 10 |
| Cs-134m | 10^5 | 4×10^{11} | 10^3 |
| Cs-134 | 10^4 | 7×10^9 | 10 |
| Cs-135 | 10^7 | 4×10^{11} | 10^4 |
| Cs-136 | 10^5 | 5×10^9 | 10 |
| Cs-137+ | 10^4 | $2 \times 10^{10(a)}$ | 10 |
| Cs-138 | 10^4 | | 10 |
| Ba-131 | 10^6 | 2×10^{10} | 10^2 |

| 1 | 2 | 3 | 4 |
|---------|--------|--------------------|--------|
| Ba-140+ | 10^5 | 5×10^9 | 10 |
| La-140 | 10^5 | 4×10^9 | 10 |
| Ce-139 | 10^6 | 7×10^{10} | 10^2 |
| Ce-141 | 10^7 | 2×10^{11} | 10^2 |
| Ce-143 | 10^6 | 9×10^9 | 10^2 |
| Ce-144+ | 10^5 | 2×10^9 | 10^2 |
| Pr-142 | 10^5 | 4×10^9 | 10^2 |
| Pr-143 | 10^6 | 3×10^{10} | 10^4 |
| Nd-147 | 10^6 | 6×10^{10} | 10^2 |
| Nd-149 | 10^6 | 6×10^9 | 10^2 |
| Pm-147 | 10^7 | 4×10^{11} | 10^4 |
| Pm-149 | 10^6 | 2×10^{10} | 10^3 |
| Sm-151 | 10^8 | 4×10^{11} | 10^4 |
| Sm-153 | 10^6 | 9×10^{10} | 10^2 |
| Eu-152 | 10^6 | 10^{10} | 10 |
| Eu-152m | 10^6 | 8×10^9 | 10^2 |
| Eu-154 | 10^6 | 9×10^9 | 10 |
| Eu-155 | 10^7 | 2×10^{11} | 10^2 |
| Gd-153 | 10^7 | 10^{11} | 10^2 |
| Gd-159 | 10^6 | 3×10^{10} | 10^3 |
| Tb-160 | 10^6 | 10^{10} | 10 |
| Dy-165 | 10^6 | 9×10^9 | 10^3 |
| Dy-166 | 10^6 | 9×10^9 | 10^3 |
| Ho-166 | 10^5 | 4×10^9 | 10^3 |
| Er-169 | 10^7 | 4×10^{11} | 10^4 |
| Er-171 | 10^6 | 8×10^9 | 10^2 |
| Tm-170 | 10^6 | 3×10^{10} | 10^3 |
| Tm-171 | 10^8 | 4×10^{11} | 10^4 |
| Yb-175 | 10^7 | 3×10^{11} | 10^3 |
| Lu-177 | 10^7 | 3×10^{11} | 10^3 |
| Hf-181 | 10^6 | 2×10^{10} | 10 |
| Ta-182 | 10^4 | 9×10^9 | 10 |
| W-181 | 10^7 | 3×10^{11} | 10^3 |
| W-185 | 10^7 | 4×10^{11} | 10^4 |
| W-187 | 10^6 | 2×10^{10} | 10^2 |
| Re-186 | 10^6 | 2×10^{10} | 10^3 |
| Re-188 | 10^5 | 4×10^9 | 10^2 |
| Os-185 | 10^6 | 10^{10} | 10 |
| Os-191 | 10^7 | 10^{11} | 10^2 |
| Os-191m | 10^7 | 4×10^{11} | 10^3 |
| Os-193 | 10^6 | 2×10^{10} | 10^2 |

| 1 | 2 | 3 | 4 |
|---------|--------|---------------------|--------|
| Ir-190 | 10^6 | 7×10^9 | 10 |
| Ir-192 | 10^4 | 10^{10} | 10 |
| Ir-194 | 10^5 | 3×10^9 | 10^2 |
| Pt-191 | 10^6 | 4×10^{10} | 10^2 |
| Pt-193m | 10^7 | 4×10^{11} | 10^3 |
| Pt-197 | 10^6 | 2×10^{11} | 10^3 |
| Pt-197m | 10^6 | 10^{11} | 10^2 |
| Au-198 | 10^6 | 10^{10} | 10^2 |
| Au-199 | 10^6 | 10^{11} | 10^2 |
| Hg-197 | 10^7 | 2×10^{11} | 10^2 |
| Hg-197m | 10^6 | 10^{11} | 10^2 |
| Hg-203 | 10^5 | 5×10^{10} | 10^2 |
| Tl-200 | 10^6 | 9×10^9 | 10 |
| Tl-201 | 10^6 | 10^{11} | 10^2 |
| Tl-202 | 10^6 | 2×10^{10} | 10^2 |
| Tl-204 | 10^4 | 10^{11} | 10^4 |
| Pb-203 | 10^6 | 4×10^{10} | 10^2 |
| Pb-210+ | 10^4 | 10^{10} | 10 |
| Pb-212+ | 10^5 | 7×10^9 | 10 |
| Bi-206 | 10^5 | 3×10^9 | 10 |
| Bi-207 | 10^6 | 7×10^9 | 10 |
| Bi-210 | 10^6 | 10^{10} | 10^3 |
| Bi-212+ | 10^5 | 7×10^9 | 10 |
| Po-203 | 10^6 | | 10 |
| Po-205 | 10^6 | | 10 |
| Po-207 | 10^6 | | 10 |
| Po-210 | 10^4 | 4×10^{11} | 10 |
| At-211 | 10^7 | 2×10^{11} | 10^3 |
| Rn-220+ | 10^7 | | 10^4 |
| Rn-222+ | 10^8 | 3×10^9 | 10 |
| Ra-223+ | 10^5 | 4×10^9 | 10^2 |
| Ra-224+ | 10^5 | 4×10^9 | 10 |
| Ra-225 | 10^5 | 2×10^9 | 10^2 |
| Ra-226+ | 10^4 | 2×10^9 (b) | 10 |
| Ra-227 | 10^6 | | 10^2 |
| Ra-228+ | 10^5 | 6×10^9 | 10 |
| Ac-228 | 10^6 | 6×10^9 | 10 |
| Th-226+ | 10^7 | | 10^3 |
| Th-227 | 10^4 | 10^{11} | 10 |
| Th-228+ | 10^4 | 5×10^9 | 1 |
| Th-229+ | 10^3 | 5×10^{10} | 1 |

| 1 | 2 | 3 | 4 |
|-----------|--------|--------------------|--------|
| Th-230 | 10^4 | 10^{11} | 1 |
| Th-231 | 10^7 | 4×10^{11} | 10^3 |
| Th-232nat | 10^3 | | 1 |
| Th-234+ | 10^5 | 3×10^9 | 10^3 |
| Pa-230 | 10^6 | 2×10^{10} | 10 |
| Pa-231 | 10^3 | 4×10^{10} | 1 |
| Pa-233 | 10^7 | 5×10^{10} | 10^2 |
| U-230+ | 10^5 | 4×10^{11} | 10 |
| U-231 | 10^7 | | 10^2 |
| U-232+ | 10^3 | 4×10^{11} | 1 |
| U-233 | 10^4 | 4×10^{11} | 10 |
| U-234 | 10^4 | 4×10^{11} | 10 |
| U-235+ | 10^4 | | 10 |
| U-236 | 10^4 | | 10 |
| U-237 | 10^6 | | 10^2 |
| U-238+ | 10^4 | | 10 |
| U-238nat | 10^3 | | 1 |
| U-239 | 10^6 | | 10^2 |
| U-240 | 10^7 | | 10^3 |
| U-240+ | 10^6 | | 10 |
| Np-237+ | 10^3 | 2×10^{11} | 1 |
| Np-239 | 10^7 | 7×10^{10} | 10^2 |
| Np-240 | 10^6 | | 10 |
| Pu-234 | 10^7 | | 10^2 |
| Pu-235 | 10^7 | | 10^2 |
| Pu-236 | 10^4 | 3×10^{11} | 10 |
| Pu-237 | 10^7 | 2×10^{11} | 1 |
| Pu-238 | 10^4 | $10^{11}(b)$ | 1 |
| Pu-239 | 10^4 | 10^{11} | 1 |
| Pu-240 | 10^3 | 10^{11} | 10^3 |
| Pu-241 | 10^5 | 4×10^{11} | 10^2 |
| Pu-242 | 10^4 | 10^{11} | 1 |
| Pu-243 | 10^7 | | 10^3 |
| Pu-244 | 10^4 | 4×10^9 | 1 |
| Am-241 | 10^4 | $10^{11}(b)$ | 1 |
| Am-242 | 10^6 | | 10^3 |
| Am-242m+ | 10^4 | 10^{11} | 1 |
| Am-243+ | 10^3 | 5×10^{10} | 1 |
| Cm-242 | 10^5 | 4×10^{11} | 10^2 |
| Cm-243 | 10^4 | 9×10^{10} | 1 |
| Cm-244 | 10^4 | 2×10^{11} | 10 |

| 1 | 2 | 3 | 4 |
|---------|--------|--------------------|--------|
| Cm-245 | 10^3 | 9×10^{10} | 1 |
| Cm-246 | 10^3 | 9×10^{10} | 1 |
| Cm-247 | 10^4 | 3×10^{10} | 1 |
| Cm-248 | 10^3 | 2×10^8 | 1 |
| Bk-249 | 10^6 | 4×10^{11} | 10^3 |
| Cf-246 | 10^6 | | 10^3 |
| Cf-248 | 10^4 | 4×10^{11} | 10 |
| Cf-249 | 10^3 | 3×10^{10} | 1 |
| Cf-250 | 10^4 | 2×10^{11} | 10 |
| Cf-251 | 10^3 | 7×10^{10} | 1 |
| Cf-252 | 10^4 | 5×10^8 | 10 |
| Cf-253 | 10^5 | 4×10^{11} | 10^2 |
| Cf-254 | 10^3 | 10^7 | 1 |
| Es-253 | 10^5 | | 10^2 |
| Es-254 | 10^4 | | 10 |
| Es-254m | 10^6 | | 10^2 |
| Fm-254 | 10^7 | | 10^4 |
| Fm-255 | 10^6 | | 10^3 |

Objaśnienia:

- (a) poziom aktywności włącznie z udziałem izotopów pochodnych o czasie połowicznego rozpadu krótszym niż 10 dni;
- (b) włącznie z neutronowymi źródłami z berylem.

Izotopy opatrzone wskaźnikiem „+” lub „nat” (naturalny) oznaczają izotopy macierzyste znajdujące się w stanie równowagi wiekowej ze swymi pochodnymi, podanymi niżej; w takich przypadkach wartości poziomu progowego aktywności źródła niekontrolowanego podane w tabeli odnoszą się tylko do izotopów macierzystych, gdyż uwzględniają one również udział izotopów pochodnych:

| Izotopy macierzyste | Izotopy pochodne |
|---------------------|--|
| 1 | 2 |
| Sr-80+ | Rb-80 |
| Sr-90+ | Y-90 |
| Zr-93+ | Nb-93m |
| Zr-97+ | Nb-97 |
| Ru-106+ | Rh-106 |
| Ag-108m+ | Ag-108 |
| Cs-137+ | Ba-137 |
| Ba-140+ | La-140 |
| Ce-134+ | La-134 |
| Ce-144+ | Pr-144 |
| Pb-210+ | Bi-210, Po-210 |
| Pb-212+ | Bi-212, Tl-208, Po-212 |
| Bi-212+ | Tl-208, Po-212 |
| Rn-220+ | Po-216 |
| Rn-222+ | Po-218, Pb-214, Bi-214, Po-214 |
| Ra-223+ | Rn-219, Po-215, Pb-211, Bi-211, Tl-207 |
| Ra-224+ | Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 |
| Ra-226+ | Rn-222, Po-218, Pb-214, Bi-214, Pb-210, Bi-210, Po-210, Po-214 |

| 1 | 2 |
|-----------|--|
| Ra-228+ | Ac-228 |
| Th-226+ | Ra-222, Rn-218, Po-214 |
| Th-228+ | Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 |
| Th-229+ | Ra-225, Ac-225, Fr-221, Ar-217, Bi-213, Po-213, Pb-209 |
| Th-232nat | Ra-228, Ac-228, Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 |
| Th234+ | Pa-234m |
| U-230+ | Th-226, Ra-222, Rn-218, Po-214 |
| U-232+ | Th-228, Ra-224, Rn-220, Po-216, Pb-212, Bi-212, Tl-208, Po-212 |
| U-235+ | Th-231 |
| U-238+ | Th-234, Pa-234m |
| U-238nat | Th-234, Pa-234m, U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Pb-210, Bi-210, Po-210, Po-214 |
| U-240+ | Np-240 |
| Np-237+ | Pa-233 |
| Am-242m+ | Am-242 |
| Am-243+ | Np-239 |