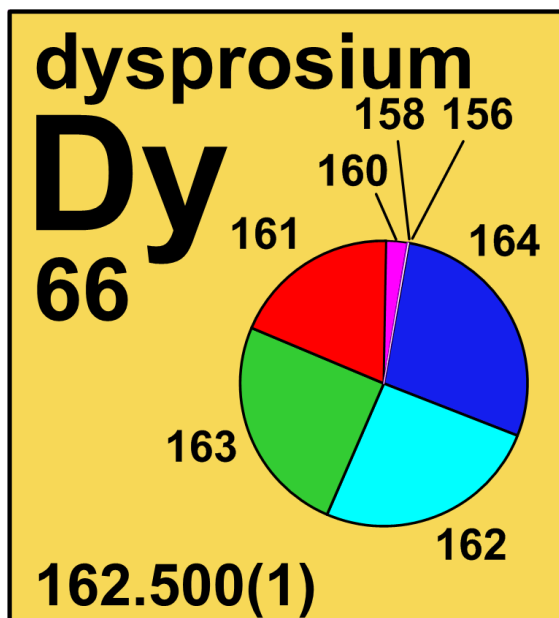


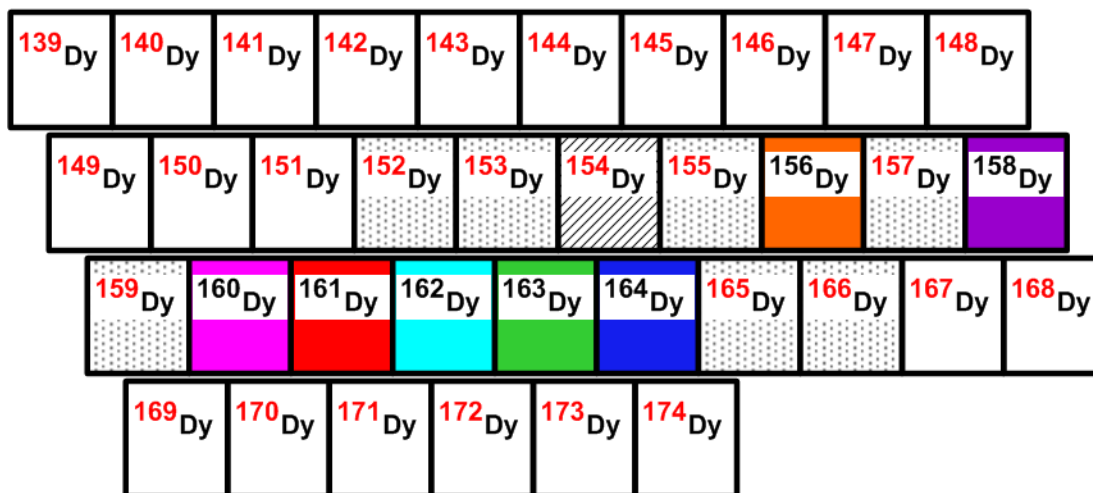
4.66 dysprosium



Stable isotope	Relative atomic mass	Mole fraction
^{156}Dy	155.924 28	0.000 56
^{158}Dy	157.924 42	0.000 95
^{160}Dy	159.925 20	0.023 29
^{161}Dy	160.926 94	0.188 89
^{162}Dy	161.926 81	0.254 75
^{163}Dy	162.928 74	0.248 96
^{164}Dy	163.929 18	0.282 60

Half-life of radioactive isotope

Less than 1 hour	
Between 1 hour and 1 year	
Greater than 1 year	



4.66.1 Dysprosium isotopes in industry

The **isotopes** of dysprosium are highly magnetic and have been the subject of physics research involving interactions of isotopes and the structure of lattice supersolids (spatially ordered material with superfluid properties, i.e., zero viscosity). The Magneto-Optical Trapping (MOT) chamber is used for slowing atoms (isotopes) to study the physics of neutral atoms by using a laser light to cool atoms (“Doppler cooling”) and magnetic quadrupole fields to slow and “trap” the neutral atoms (Figure 4.66.1) [459, 460].

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^{164}Dy has a large **neutron absorption cross section**, so dysprosium is used for **control rods** [461]. ^{161}Dy has been a key isotope for studying the Mössbauer Effect, which is the resonance and absorption of **gamma ray** emissions on nearby atoms in a solid state [462].

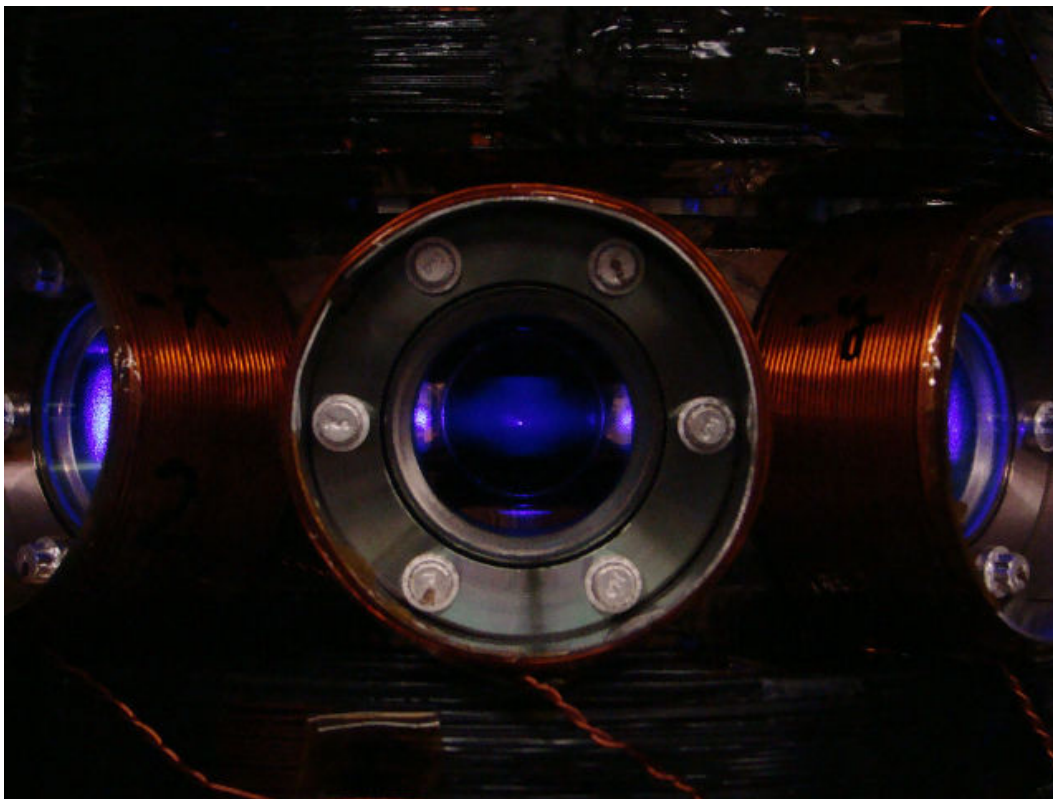


Fig. 4.66.1: Magneto-Optical Trapping (MOT) of **isotopes** of dysprosium. (Used with permission from: Prof. Benjamin Lev, Stanford University) [463].

4.66.2 Dysprosium isotopes in medicine

^{165}Dy (with a **half-life** of 140 minutes) is used commonly in arthritis therapy (**radiosynovectomy**). Rheumatic inflammation of the membranes of joints is often treated by the injection of ^{165}Dy -ferric oxide directly into the joint space of the knee. Leakage from the joint has been shown to be minimal [464].

4.66.3 Dysprosium isotopes used as a source of radioactive isotope(s)

^{164}Dy is used to produce ^{166}Dy (with a half-life of 3.4 days) via double neutron capture [465-467]. ^{166}Dy , which decays to ^{166}Ho , is used in cancer and arthritis therapy [465, 468].