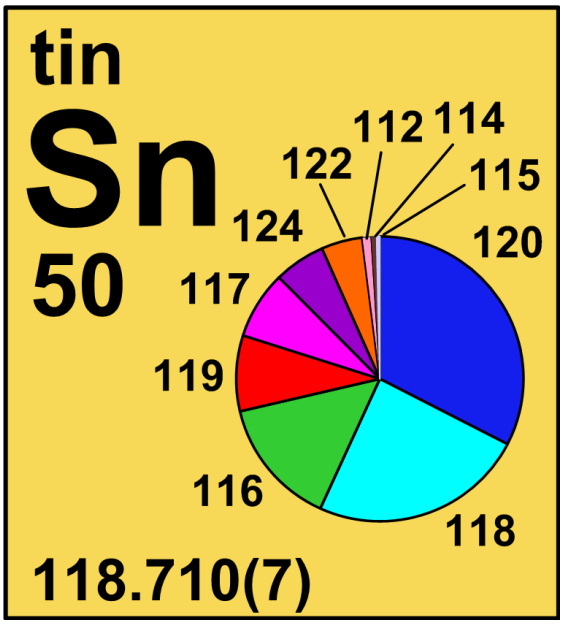
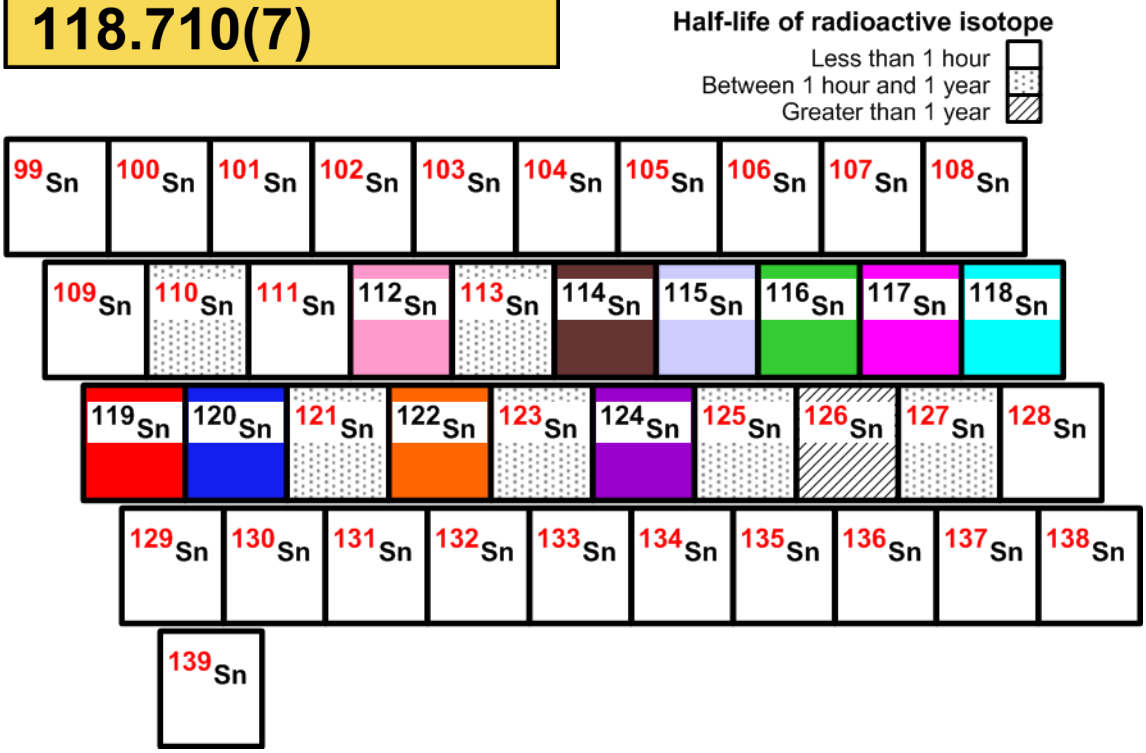
4.50 tin



Stable isotope	Relative atomic mass	Mole fraction
^{112}Sn	111.904 824	0.0097
^{114}Sn	113.902 783	0.0066
^{115}Sn	114.903 3447	0.0034
^{116}Sn	115.901 743	0.1454
^{117}Sn	116.902 954	0.0768
^{118}Sn	117.901 607	0.2422
^{119}Sn	118.903 311	0.0859
^{120}Sn	119.902 202	0.3258
^{122}Sn	121.903 44	0.0463
^{124}Sn	123.905 277	0.0579



4.50.1 Tin isotopes in Earth/planetary science

Molecules, atoms, and ions of the **stable isotopes** of tin possess slightly different physical and chemical properties, and they commonly will be fractionated during physical, chemical, and biological processes, giving rise to variations in **isotopic abundances** and in **atomic weights**.

There are measureable variations in the isotopic abundances of tin in natural terrestrial materials (Figure 4.50.1) [363].

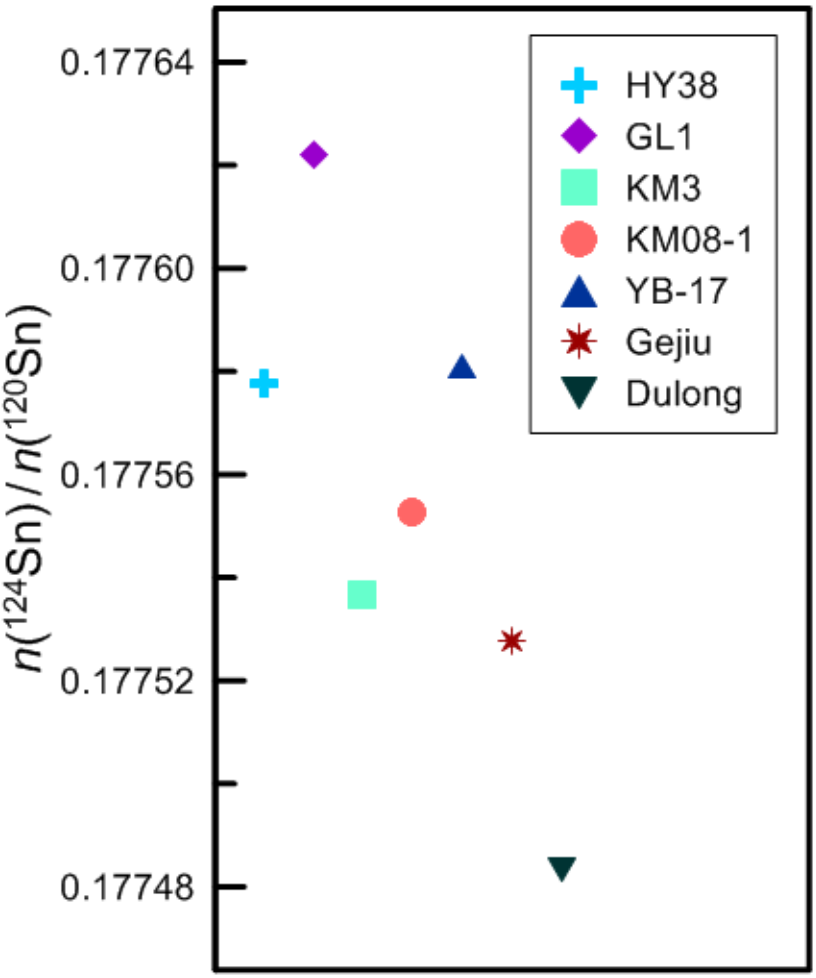


Fig. 4.50.1: Variation of the **isotope amount ratio** $n(^{124}Sn)/n(^{120}Sn)$ of selected cassiterite samples from China (modified after [363]).

4.50.2 Tin isotopes in medicine

^{117m}Sn (with a **half-life** of 14 days) **DTPA** is used routinely for diagnostic bone imaging and treatment of bone pain caused by the spread of cancer to bones. The m the superscript of ^{117m}Sn indicates a **metastable isotope**. By using ^{117m}Sn DTPA, marrow toxicity can be reduced, and the therapeutic efficacy of using **radionuclides** is maintained [364]. ^{117m}Sn is a promising radionuclide for therapeutic applications because the radionuclide decays in a way that causes less damage to healthy tissues and bone marrow than other available treatments. These properties

of ^{117m}Sn make it useful for the treatment of inflammatory synovial disease (i.e. rheumatoid arthritis) [365].

4.50.3 Tin isotopes used as a source of radioactive isotope(s)

^{112}Sn is used to produce the **radioisotope** ^{113}Sn (with a half-life of 115 days) via the reaction ^{112}Sn (n, γ) ^{113}Sn. This is used for *n*(^{113}Sn)/*n*(^{113m}In) generators for the elution (extracting one material from another) of ^{113m}In (with a half-life of 1.66 hours) as chloride for blood pool imaging. The m the superscript of ^{113m}In indicates a **metastable isotope**. ^{117m}Sn is a medical radioisotope that can be produced using ^{116}Sn and ^{117}Sn [366].