4.22 titanium

The isotope-amount ratio $n^{50}\text{Ti}/n^{46}\text{Ti}$ is used to study the early history of the Solar System. The value of the ratio can help determine whether the Solar System was created from a well-homogenized source [194, 195]. For example, variations in titanium isotopic compositions of various groups of meteorites can be observed (Figure 4.22.1) [196].
Fig. 4.22.1: Cross plot of the isotope-amount ratio $n(^{50}\text{Ti})/n(^{47}\text{Ti})$ and the isotope-amount ratio $n(^{46}\text{Ti})/n(^{47}\text{Ti})$ of selected groups of meteorites (modified from [196], assuming measured $n(^{50}\text{Ti})/n(^{47}\text{Ti})$ and $n(^{46}\text{Ti})/n(^{47}\text{Ti})$ isotope-amount ratios of 0.697 19 and 1.109 18, respectively [197]. Normal titanium isotopic compositions were observed in standards, but $^{46}\text{Ti}$ and $^{50}\text{Ti}$ isotope anomalies were resolved among different meteorite groups.

4.22.2 Titanium isotopes in industry

The isotope-amount ratio $n(^{48}\text{Ti})/n(^{49}\text{Ti})$ has been used in Isotope Ratio Method (IRM) analysis (initial titanium ratio/final titanium ratio) to estimate the energy production of nuclear reactors. This ratio can also be used to confirm that a reactor is being used for non-proliferation purposes (purposes other than to assist in the formation of nuclear weapon grade materials) [198].