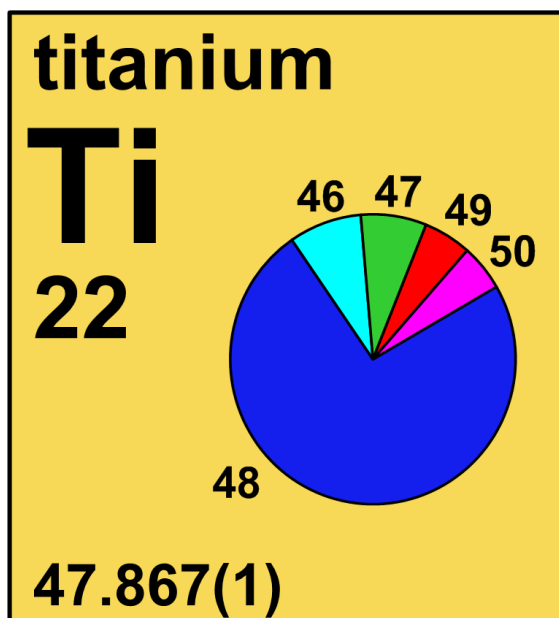




## 4.22 titanium




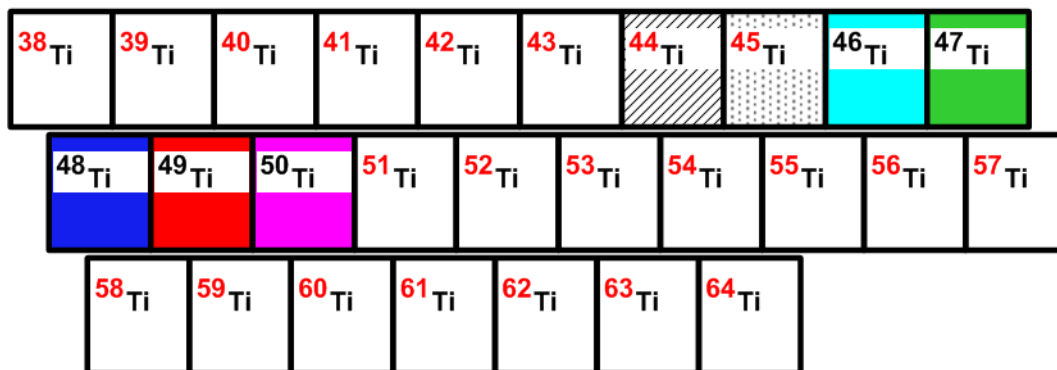
Stable isotope	Relative atomic mass	Mole fraction
$^{46}\text{Ti}$	45.952 628	0.0825
$^{47}\text{Ti}$	46.951 759	0.0744
$^{48}\text{Ti}$	47.947 942	0.7372
$^{49}\text{Ti}$	48.947 866	0.0541
$^{50}\text{Ti}$	49.944 787	0.0518

## Half-life of radioactive isotope

Less than 1 hour 

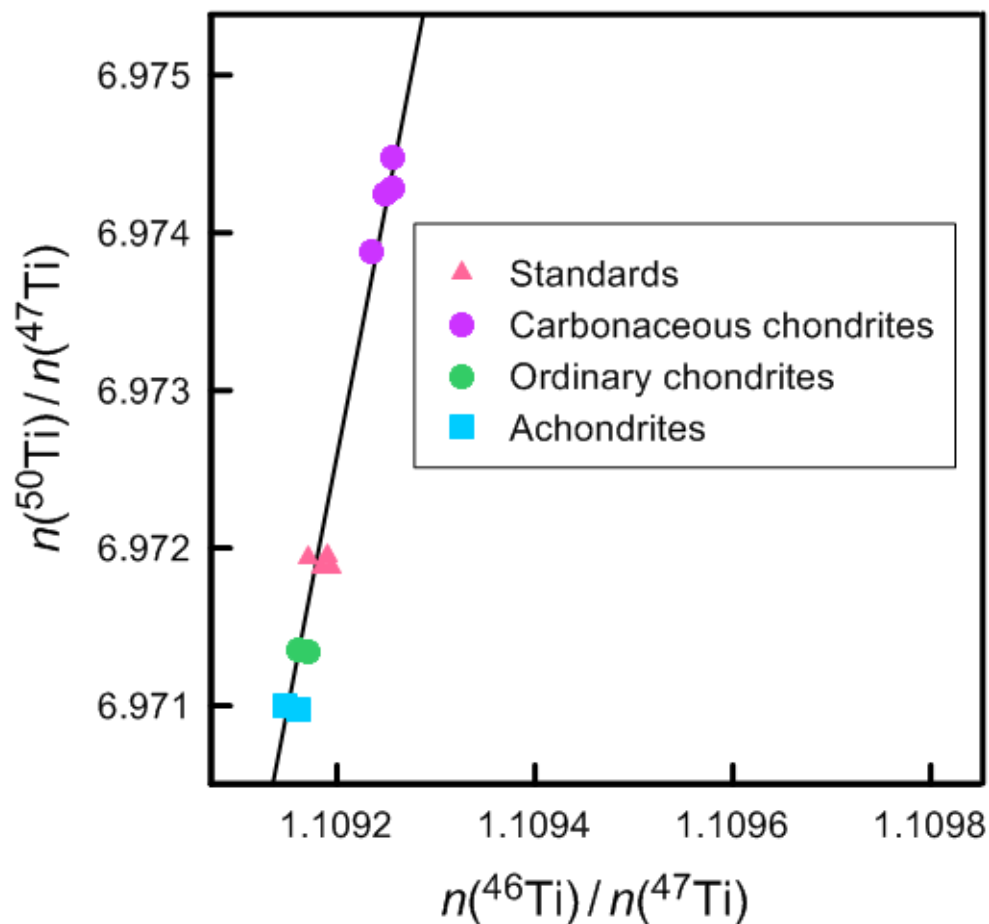
Between 1 hour and 1 year 

Greater than 1 year 



## 4.22.1 Titanium isotopes in Earth/planetary science

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].