

IZOTOPNA GEOLOGIJA

1. UVOD

1. Napiši Z, N i A za slijedeće nuklide

- a) ${}^1_4\text{Be}$ Z=4; N=6; A=10
b) ${}^{51}_{23}\text{V}$ Z=23; N=28; A=51
c) ${}^{222}_{86}\text{Rn}$ Z=86; N=136; A=222
d) ${}^{238}_{92}\text{U}$ Z=92; N=146; A=238

2. Odredi atomsku masu silicija ako znaš da Si ima 3 izotopa ${}^{28}\text{Si}$ (92,2%; 27,98 amu), ${}^{29}\text{Si}$ (4,7%; 28,98 amu) i ${}^{30}\text{Si}$ (3,1%; 29,97 amu). (Napomena amu=atomic mass unit, atomska jedinica mase)

Rj. $A(\text{Si})=0,922 \times 27,98 \text{amu} + 0,047 \times 28,98 \text{amu} + 0,031 \times 29,97 \text{amu} = 28,08 \text{amu}$

3. a) Odredi množinu Sr u 2,50g $\text{Sr}(\text{NO}_3)_2$ b) Koliko atoma Sr ima u 2,50g $\text{Sr}(\text{NO}_3)_2$? c) Koliko atoma ${}^{87}\text{Sr}$ ima u 2,50g $\text{Sr}(\text{NO}_3)_2$ ako je udio ${}^{87}\text{Sr}$ 7,0%? d) Koliki je omjer atoma ${}^{87}\text{Sr}/{}^{86}\text{Sr}$ u 2,50g $\text{Sr}(\text{NO}_3)_2$ ako je udio ${}^{86}\text{Sr}$ 9,9%?

Rj. a) $m(\text{Sr}(\text{NO}_3)_2) = 2,50 \text{g}$

$$n(\text{Sr}(\text{NO}_3)_2) = ?$$

$$n(\text{Sr}(\text{NO}_3)_2) = \frac{m(\text{Sr}(\text{NO}_3)_2)}{M(\text{Sr}(\text{NO}_3)_2)}$$

$$n(\text{Sr}(\text{NO}_3)_2) = \frac{2,50 \text{g}}{87,62 \text{g/mol} + 2 \times 14,01 \text{g/mol} + 6 \times 15,99 \text{g/mol}}$$

$$n(\text{Sr}(\text{NO}_3)_2) = 1,18 \times 10^{-2} \text{mol}$$

b) $m(\text{Sr}(\text{NO}_3)_2) = 2,50 \text{g}$

$$N(\text{Sr}(\text{NO}_3)_2) = ?$$

$$N(\text{Sr}(\text{NO}_3)_2) = n(\text{Sr}(\text{NO}_3)_2) \times N_A = \frac{m(\text{Sr}(\text{NO}_3)_2)}{M(\text{Sr}(\text{NO}_3)_2)} \times N_A$$

$$n(\text{Sr}(\text{NO}_3)_2) = \frac{2,50 \text{g}}{87,62 \text{g/mol} + 2 \times 14,01 \text{g/mol} + 6 \times 15,99 \text{g/mol}} \times 6,022 \times 10^{23} \text{mol}^{-1}$$

$$n(\text{Sr}(\text{NO}_3)_2) = 7,11 \times 10^{21}$$

c) $m(\text{Sr}(\text{NO}_3)_2) = 2,50 \text{ g}$
 $\omega(^{87}\text{Sr}) = 7,0\%$

$$N(^{87}\text{Sr}) = ?$$

$$N(^{87}\text{Sr}) = \omega(^{87}\text{Sr}) \times n(\text{Sr}(\text{NO}_3)_2) \times N_A = \omega(^{87}\text{Sr}) \times \frac{m(\text{Sr}(\text{NO}_3)_2)}{M(\text{Sr}(\text{NO}_3)_2)} \times N_A$$

$$n(\text{Sr}(\text{NO}_3)_2) = 0,07 \times \frac{2,50 \text{ g}}{87,62 \text{ g/mol} + 2 \times 14,01 \text{ g/mol} + 6 \times 15,99 \text{ g/mol}} \times 6,022 \times 10^{23} \text{ mol}^{-1}$$

$$n(\text{Sr}(\text{NO}_3)_2) = 4,98 \times 10^{20}$$

d) $m(\text{Sr}(\text{NO}_3)_2) = 2,50 \text{ g}$
 $\omega(^{87}\text{Sr}) = 7,0\%$
 $\omega(^{86}\text{Sr}) = 9,9\%$

$$^{87}\text{Sr} / ^{86}\text{Sr} = ?$$

$$^{87}\text{Sr} / ^{86}\text{Sr} = \omega(^{87}\text{Sr}) / \omega(^{86}\text{Sr}) = 0,070 / 0,099 = 0,707$$

4. Koncentracija K_2O u uzorku ortoklasa je 8,75 tež.%. Koliko je atoma ^{40}K prisutno u 1g ovog materijala ako je udio ^{40}K u sveukupnom K 0,012%?

$$\omega(\text{K}_2\text{O}, \text{ortoklas}) = 8,75\%$$

$$m(\text{K}_2\text{O}) = 1 \text{ g}$$

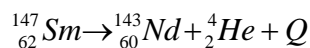
$$\omega(^{40}\text{K}, \text{K}) = 0,012\%$$

$$N(^{40}\text{K}) = ?$$

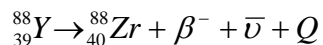
$$N(^{40}\text{K}) = N(\text{K}) \times \omega(^{40}\text{K}) \times \omega(\text{K}, \text{ortoklas}) = 1,28 \times 10^{22} \times 0,00012 \times 0,087 = 1,34 \times 10^{17}$$

$$N(\text{K}) = 2 \times N(\text{K}_2\text{O}) = 2 \times \frac{m(\text{K}_2\text{O})}{M(\text{K}_2\text{O})} \times N_A = 1,28 \times 10^{22}$$

5. a) Koji će nuklid α -nastati raspadom $^{147}_{62}\text{Sm}$



b) Koji će nuklid β -nastati raspadom $^{88}_{39}\text{Y}$



6. Izračunaj koliki će udio atoma ${}_{11}^{24}\text{Na}$ ($T_{1/2}=15,0\text{h}$) ostati neraspadnut nakon 5h.

$$T_{1/2}({}_{11}^{24}\text{Na})=15,0\text{h}$$

$$t=5,0\text{h}$$

$$N/N_0=?$$

$$\frac{N}{N_0} = e^{-\lambda t} = e^{-4,62 \times 10^{-2} \text{h}^{-1} \times 5,0 \text{h}} = 0,7937$$

$$\lambda = \ln 2 / T_{1/2} = \ln 2 / 15\text{h} = 4,62 \times 10^{-2}$$