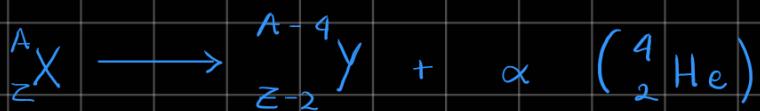


5. 9

$$A = 2Z$$

Stabilnost na  $\alpha$  razpad



Razpad je mogu, kogda velja  $E_v(A, Z) \leq E_v(A-4, Z-2) + E_v(4, 2)$

$A$  in  $Z$  sta velika in ju razvijemo

številka, ki jo potrebljamo

$$\Rightarrow 4 \frac{\partial E_v}{\partial A} + 2 \frac{\partial E}{\partial Z} - \underbrace{E_v(4, 2)}_{\text{upostevamo pogoj iz navodil}} \leq 0$$

$$\text{SEMFI: } E_v(A, Z) = -w_0 A + w_1 A^{\frac{2}{3}} + w_2 \frac{Z^2}{A^{\frac{1}{3}}} + w_3 \frac{Z}{A}$$

// upostevamo koeficiente za sproščena jedra

$$+ w_4 \frac{Z^{2/3}}{A^{2/3}} \nearrow \emptyset$$

majhu, na koncu dokazimo, da drži

$$\frac{\partial E_v}{\partial A} = -w_0 + \frac{2}{3} w_1 A^{-\frac{1}{3}} - \frac{1}{3} w_2 \frac{Z^2}{A^{\frac{4}{3}}}$$

$$\left. \frac{\partial E_v}{\partial A} \right|_{A=2Z} = -w_0 + w_1 \frac{2^{\frac{2}{3}}}{3} Z^{-\frac{1}{3}} - \frac{1}{3} w_2 Z^{\frac{2}{3}} \frac{1}{2^{\frac{4}{3}}}$$

$$\frac{\partial E_v}{\partial Z} = 2 \omega_2 \frac{Z}{A^{\frac{1}{3}}}$$

$$\left. \frac{\partial E_v}{\partial Z} \right|_{A=2Z} = 2^{\frac{2}{3}} \omega_2 Z^{\frac{2}{3}}$$

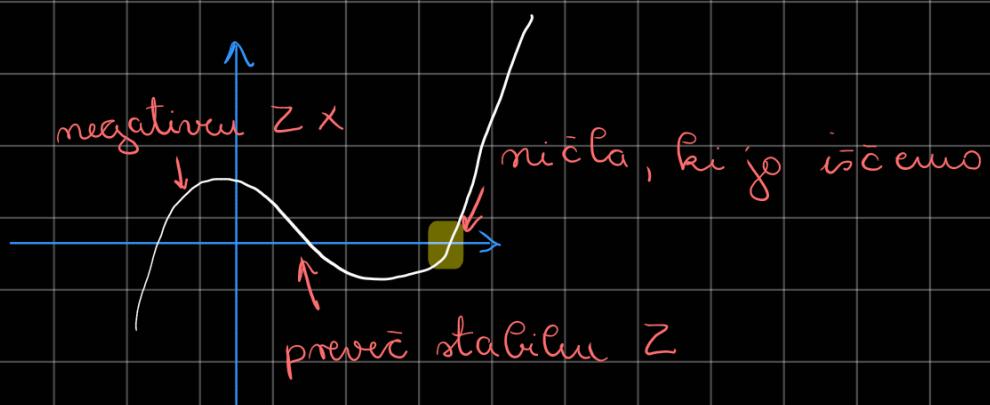
$$-9\omega_0 + \frac{2^{\frac{8}{3}}}{3} Z^{-\frac{1}{3}} - \frac{2^{\frac{2}{3}}}{3} \omega_2 Z^{\frac{2}{3}} + 2^{\frac{5}{3}} \omega_2 Z^{\frac{2}{3}}$$

$$\frac{\partial E_v}{\partial A} - E_v(4,2) \leq \emptyset$$

Nemazgo pomnožimo  $\propto Z^{\frac{1}{3}}$

$$-9\omega_0 Z^{\frac{1}{3}} + \frac{2^{\frac{3}{3}}}{3} \omega_1 - \frac{2^{\frac{2}{3}}}{3} \omega_2 Z + 2^{\frac{5}{3}} \omega_2 Z + E_v(4-2) Z^{\frac{1}{3}} \leq \emptyset$$

Kubicka eraēba, kiu iina 3 nīči. V navodilih piše, da jē era nīča negatīvna



Nāsa nīča jē med  $40 \leq Z \leq 50$

Iteratīvno rēšēmo

$$Z \left[ 2^{\frac{5}{3}} w_2 - \frac{2^{\frac{2}{3}}}{3} w_2 \right] = Z^{\frac{1}{3}} \left[ 4w_0 + E_v(4,2) \right] - \frac{2^{\frac{8}{3}}}{3} w_1$$

$$Z^{(m+1)} = \frac{Z_m^{\frac{1}{3}} \left[ 4w_0 + E_v(4,2) \right] - \frac{2^{\frac{8}{3}}}{3} w_1}{2^{\frac{2}{3}} \left( 2 - \frac{1}{3} \right)}$$

$m$  ... index iterace

Za začtek vstavimo  $Z_0 = 50$

$m$	$Z$
0	50
1	46'9
2	45'5
3	44'8
:	
6	44'2

$$\Rightarrow Z' = 44$$

Po 6. iteracií se spřemíjí samo na desetinného v  $Z \in \mathbb{Z}$

Ne vnuť, ani fja marasča ali pada už zato vstavimo

$Z = 43$  in  $Z = 45$ , v nemáčko

Vstavimo v  $\mathcal{L}$ ,  $Z' + 1$  nestabilna  
 $Z' - 1$  stabilna

Jedna  $Z > 94$  so nestabilna na  $\alpha$ -rozpad

Prievium je  $w_4 \frac{\delta_{ZN}}{A^{\frac{3}{4}}} = E_{v5} //$  pozna se v odvodu  $\frac{\partial E_v}{\partial A}$

$$\Rightarrow 9 \frac{\partial E_{v5}}{\partial A} \Big|_{A=2Z} = 4 w_4 \delta_{ZN} \left(-\frac{3}{9}\right) A^{-\frac{7}{4}} \Big|_{A=2Z}$$

$$= -3 \cdot 2^{-\frac{7}{4}} w_4 \delta_{ZN} Z^{-\frac{7}{4}}$$

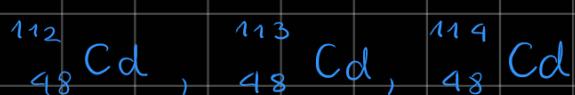
$$Z_{m+1} = \frac{Z_m^{\frac{1}{3}} \left[ 4w_0 + E_v(4,2) \right] - \frac{2^{\frac{8}{3}}}{3} w_1 + \alpha w_4 Z^{-\frac{17}{12}}}{2^{\frac{2}{3}} \left( 2 - \frac{1}{3} \right)}$$

// dodamo člen

Popravki so  $\delta_{ZN} = 1 \Rightarrow Z' = 94'9$

$\delta_{ZN} = -1 \Rightarrow Z' = 94'1$

Neznana malača



$$u = 931'484 \frac{\text{MeV}}{\text{c}^2}$$

$$M(^{112}_{48} \text{Cd}) = 111'902'758 u$$

$$M(^{113}_{48} \text{Cd}) = 112'904'400 u$$

$$M(^{114}_{48} \text{Cd}) = 113'903'352 u$$

Ne poznamo vrednosti  $w_i$ ,  $i = 0, 1, \dots, 4 \approx Cd$

$$E_V(A, Z) = -w_0 A + w_1 A^{\frac{2}{3}} + w_2 \frac{Z^2}{A^{\frac{1}{3}}} + w_3 \frac{(A-2Z)^2}{A} + w_4 \frac{\delta_{zn}}{A^{\frac{4}{3}}}$$

$$A \pm 1$$

$$E_V(A \pm 1, Z)$$

upostevamo:

- $(1+x)^\alpha = \sum_{m=0}^{\infty} \binom{\alpha}{m} x^m \quad // \text{do 1. reda razvijemo}$

$$\binom{\alpha}{m} = \frac{\alpha(\alpha-1)\dots(\alpha-m+1)}{m!} = \prod_{k=1}^m \frac{\alpha-m+k}{k!}$$

$$\binom{-\alpha}{m} = (-1)^m \binom{\alpha+m-1}{m}$$

Razvijemo člane

- $-w_0 A \xrightarrow{A \pm 1} -w_0 A \left(1 \pm \frac{1}{A}\right) \approx -w_0 A (A \pm 1)$

- $w_1 A^{\frac{2}{3}} \xrightarrow{} w_1 (A \pm 1)^{\frac{2}{3}} = w_1 A^{\frac{2}{3}} \left(1 + \frac{1}{A}\right)^{\frac{2}{3}} \approx w_1 A^{\frac{2}{3}} \left(1 \pm \frac{2}{3} \frac{1}{A}\right)$

- $w_2 \frac{Z^2}{(A \pm 1)^{\frac{2}{3}}} \xrightarrow{} w_2 \frac{Z^2}{A^{\frac{2}{3}}} \frac{1}{\left(1 \pm \frac{1}{A}\right)^{\frac{2}{3}}} \approx w_2 \frac{Z^2 \left(1 \mp \frac{1}{A} \frac{1}{3}\right)}{A^{\frac{1}{3}}}$

- $w_3 \frac{(A-2Z)^2}{A}$

$\hookrightarrow$  numerički:  $A^{-1} = (A \pm 1)^{-1} \approx \boxed{A^{-1} (1 \mp A)}$

$\hookrightarrow$  sicer:  $(A \pm 1 - 2Z)^2 = A^2 \left(1 \pm \frac{1}{A} - \frac{2Z}{A}\right)^2 =$

$$= A^2 \left( 1 \pm 2 \left( \frac{1}{A} \right) - \frac{4Z}{A} + \left( \frac{1}{A} \right)^2 \mp \frac{4Z}{A^2} + \frac{4Z^2}{A^2} \right)$$

Zdrožimo skupaj

2. red

$$\underline{A^2 \left( 1 \pm 2 \left( \frac{1}{A} \right) - \frac{4Z}{A} + \left( \frac{1}{A} \right)^2 \mp \frac{4Z}{A^2} + \frac{4Z^2}{A^2} \right) (1 \mp A)} =$$

A

$$\frac{(A-2Z)^2}{A} + \boxed{\frac{2 \left( \frac{1}{A} \right) A^2}{A}} - \frac{4Z}{A^2} \frac{A^2}{A} + \boxed{\frac{A^2}{A} \left( \mp \frac{1}{A} \right) + \frac{A^2}{A} \left( - \frac{4Z}{A} \right) \left( \mp \frac{1}{A} \right)}$$

$$+ \frac{A^2}{A} \left( \mp \frac{4Z}{A^2} \right) \left( \mp \frac{1}{A} \right) + \frac{A^2}{A} \left( \frac{4Z^2}{A^2} \right) \left( \mp \frac{1}{A} \right) =$$

//mnogimo s  $\frac{1}{A}$  samo tiste člene, ki nimajo že  $\frac{1}{A}$

$$= \frac{(A-2Z)^2}{A} \pm 2 \mp \frac{4Z}{A} \mp 1 \pm \frac{4Z}{A} + \frac{4Z}{A^2} \mp \frac{4Z^2}{A^2}$$