

# ANDREAS CHATZIGAPIOU NATIONAL & KAPODISTRIAN

# Transuranium elements



- **DEFINITION**

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- **SYNTHESIS**

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- DECAY MODES

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PROPERTIES





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In addition crucial role plays the ratio

Surface Energy/Coulomb Repulsion= $Z_1 \cdot Z_2 / \{Z_1 + Z_2\}$

The Z's refer to the projectile and the target Nucleus.

In the heavier elements the numerator increases largely and therefore fusion is hampered. The opposite happens in the lighter elements. All these due to shell effects!

# Cross Section

The cross section of the products is given by the formula

$$\sigma_{xn} = \sigma_{CN}(E_x) P_{xn} \Pi \{ \Gamma_n(E_x) / \Gamma_{TOT} \}$$

$\sigma_{CN}(E_x)$ : compound nucleus cross section

$P_{xn}$ : probability of neutron emission

$\Gamma_n(E_x) / \Gamma_{TOT}$ : n emission width / total decay width

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- $\beta$ -decay for  $Z < 110$ .
- Spontaneous fission when  $N \gg 184$ .

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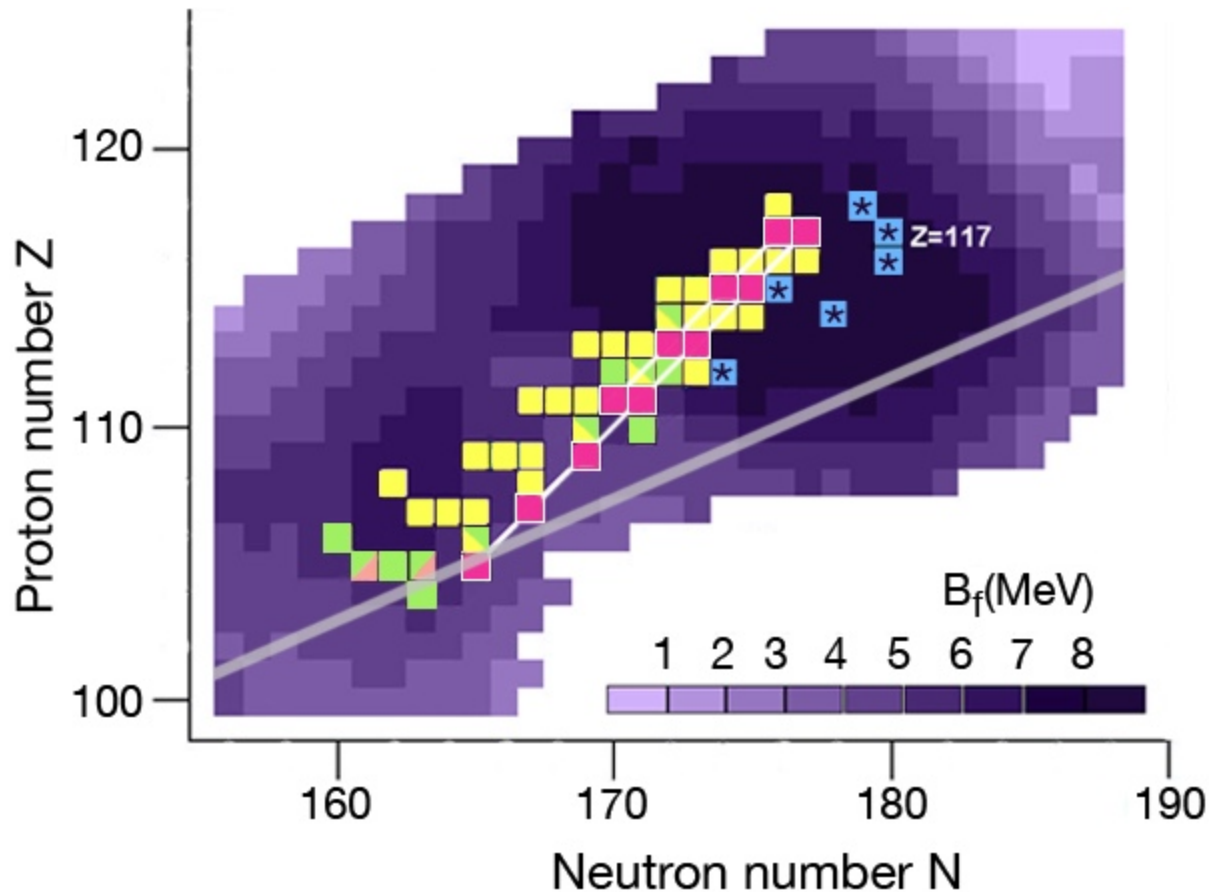
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- Half life ranges from  $t \approx 100$  days ( $^{257}\text{Fm}$ ) to few milliseconds.

# Chart of the Superheavy



Yellow boxes refer to a decay, pink  $\beta^+$  and green to spontaneous fission. The gray line marks the island of stability.

**THE END!**

**THANK YOU!**