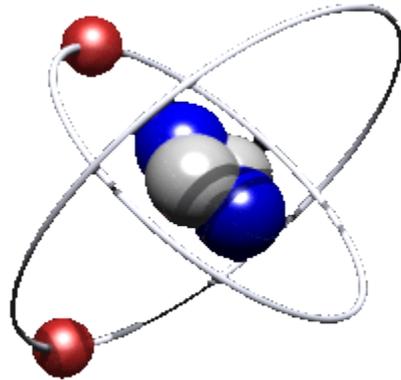
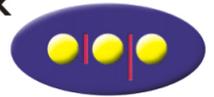




JOHANNES KEPLER
UNIVERSITÄT LINZ | JKU



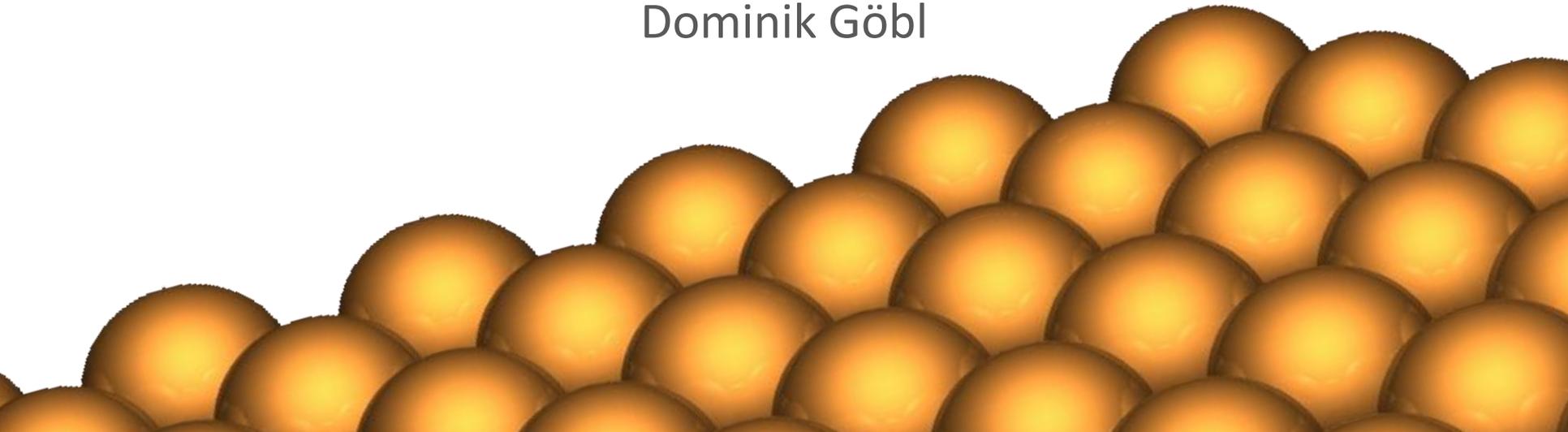
atom und
oberflächen
physik

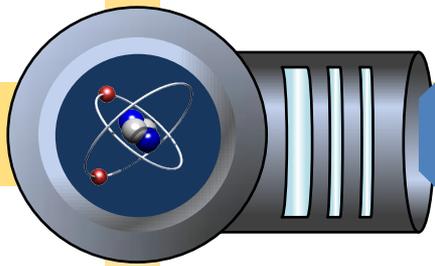


Laden und Feuern

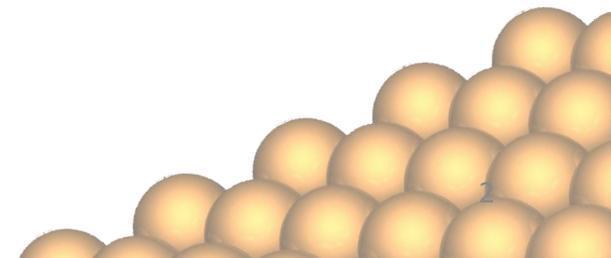
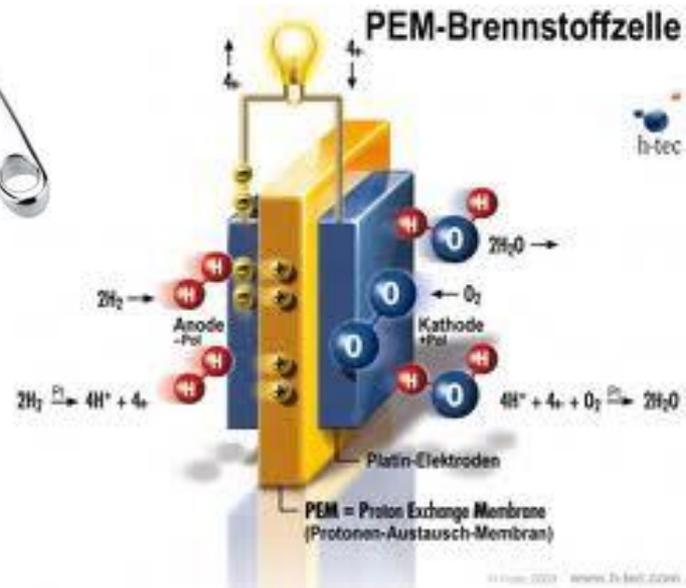
von Ionen und Oberflächen

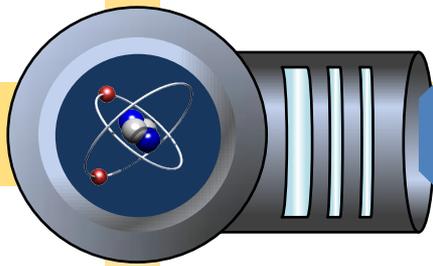
Dominik Göbl





Auf die Oberfläche kommt es an

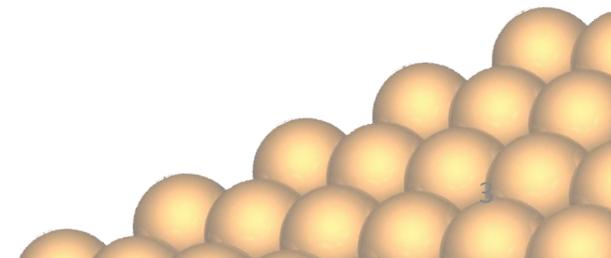
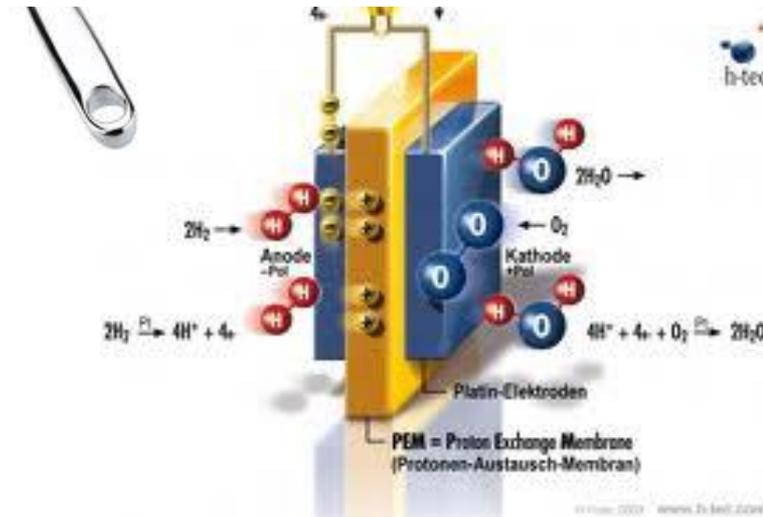


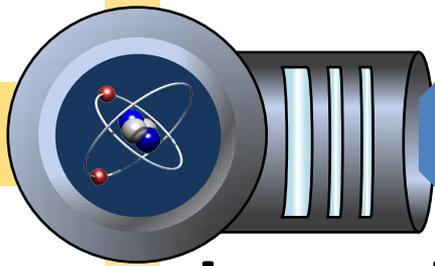


Auf die Oberfläche kommt es an



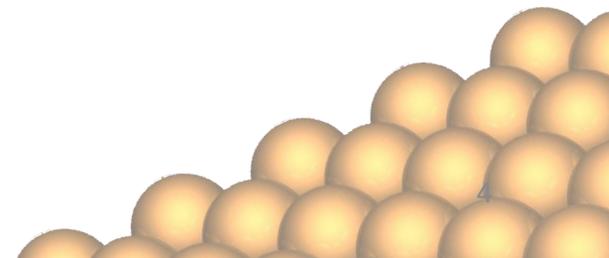
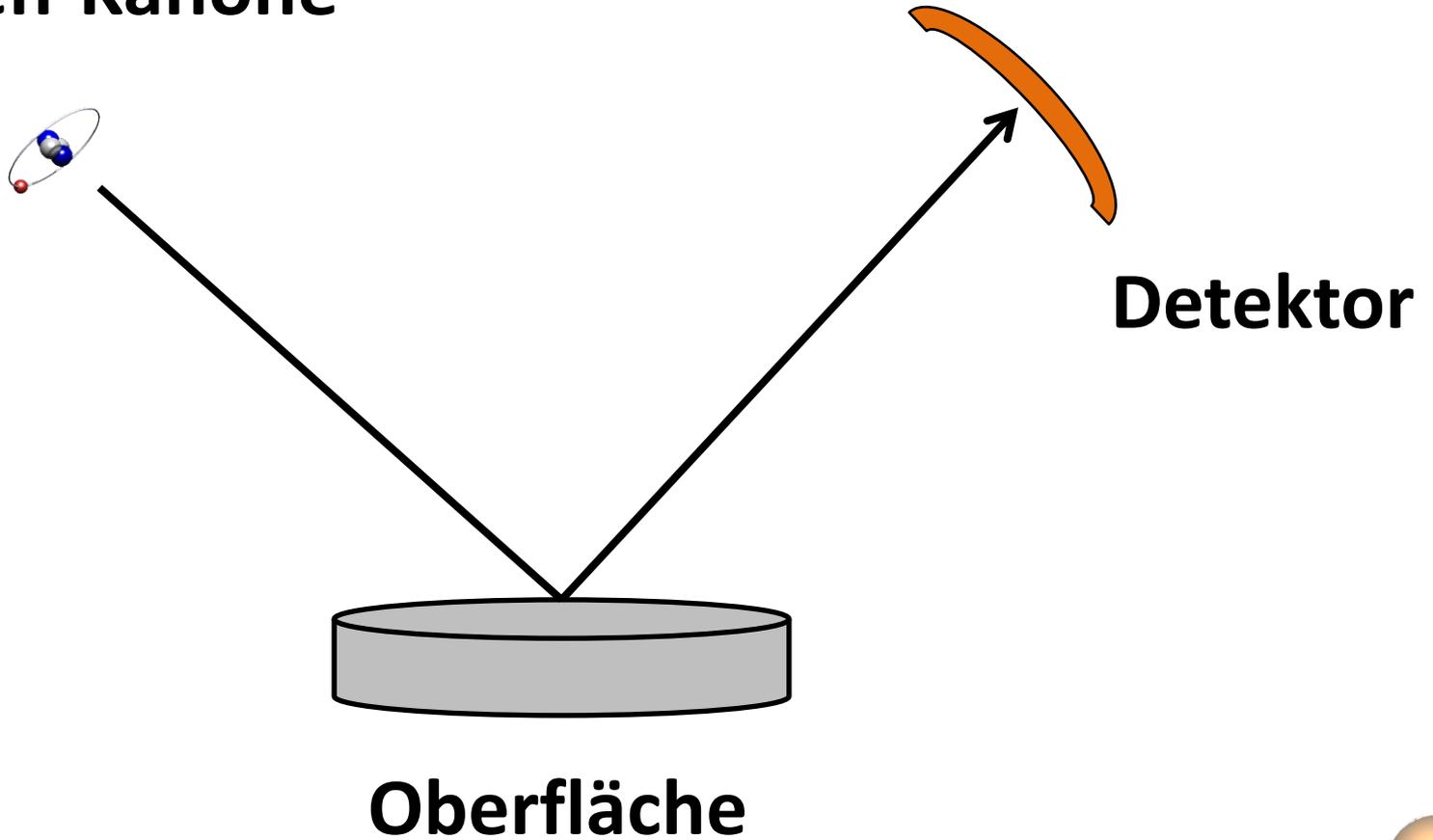
Wie bekomme ich Informationen über Oberflächen?

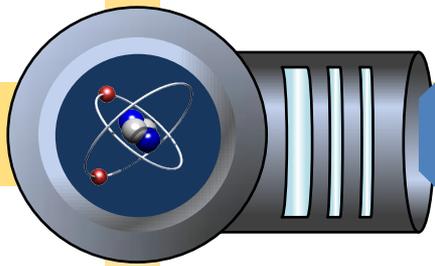




Was wird gemacht?

Ionen-Kanone





Ein Blick in die Spielzeugkiste

Wutball



28 g

Heffalump

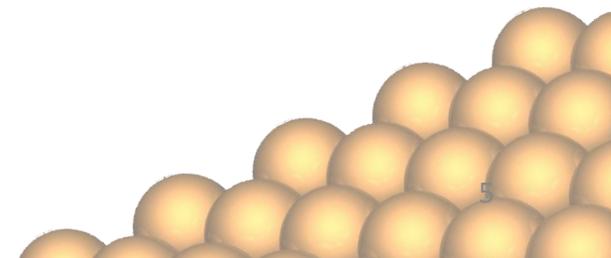


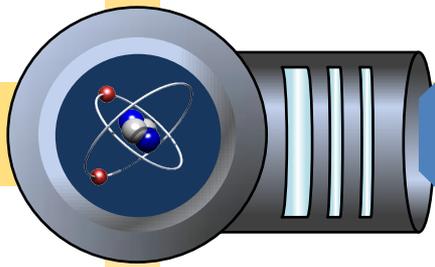
55 g

Cindarella

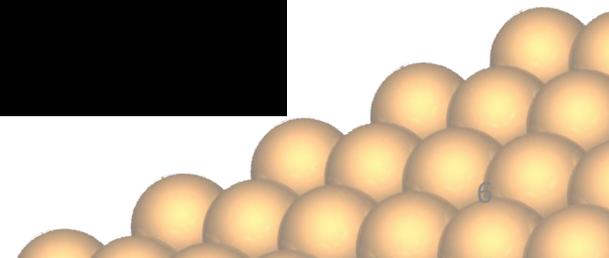


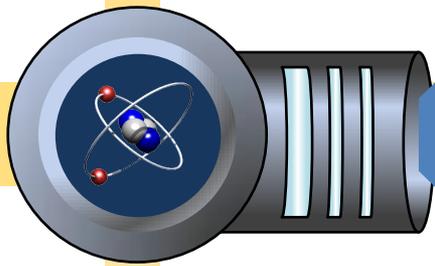
128 g



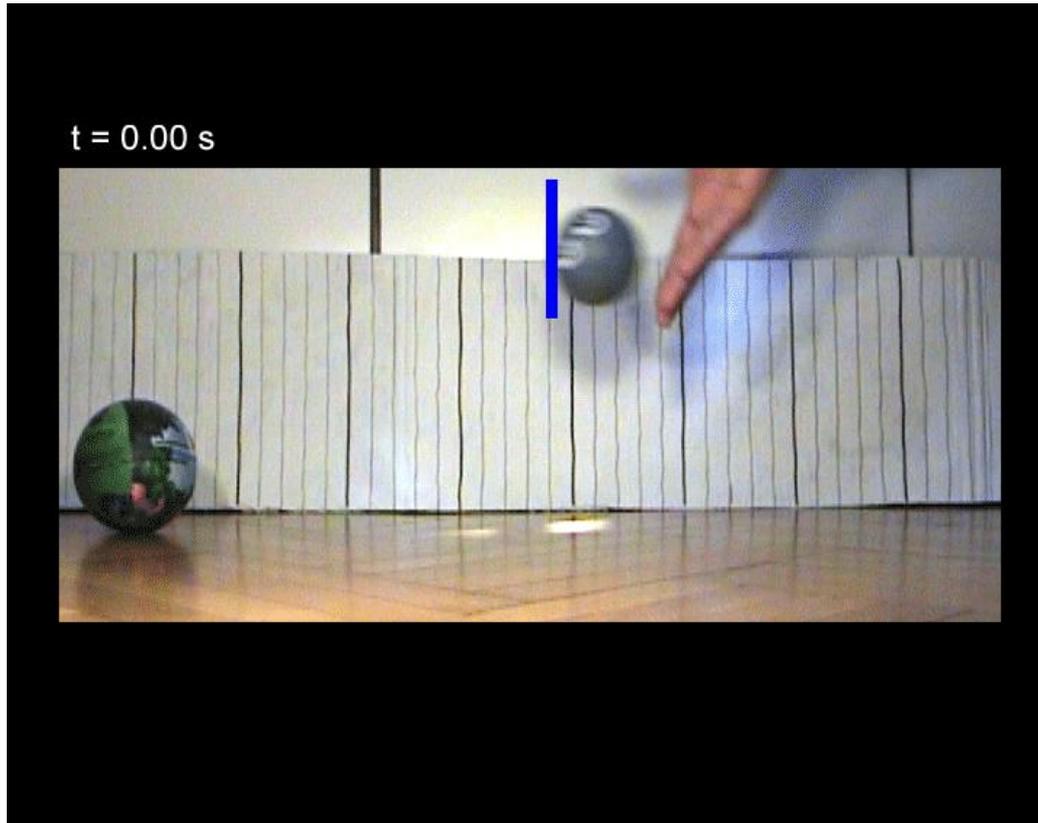


Wutball vs. Heffalump



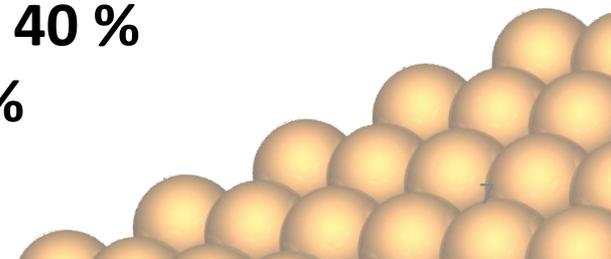


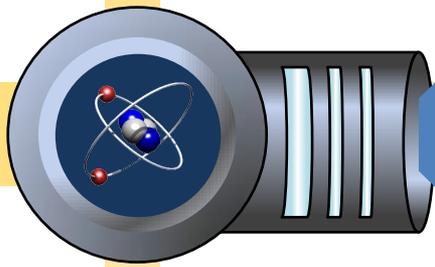
Wutball vs. Heffalump



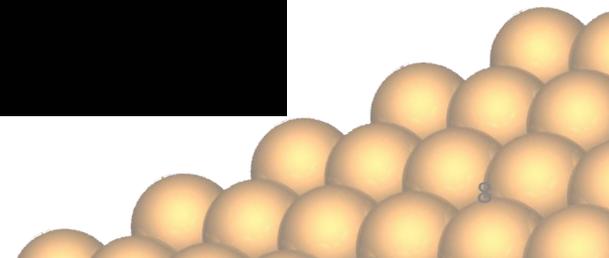
Geschwindigkeit nach dem Stoß: **40 %**

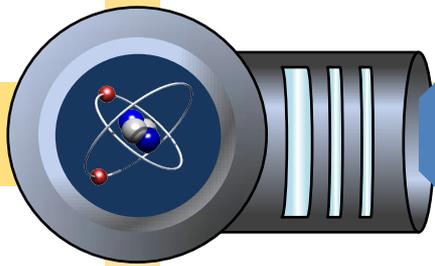
Energie nach dem Stoß: **16 %**



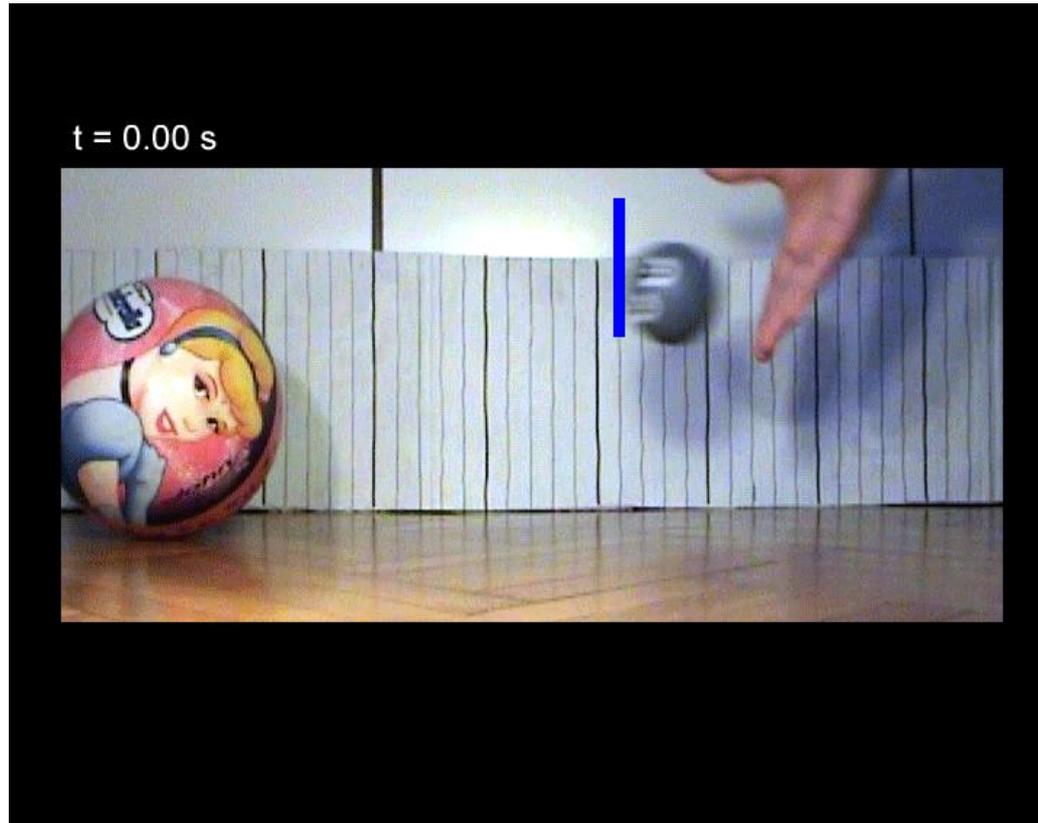


Wutball vs. Cindarella



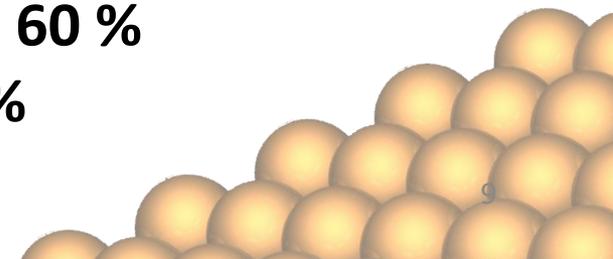


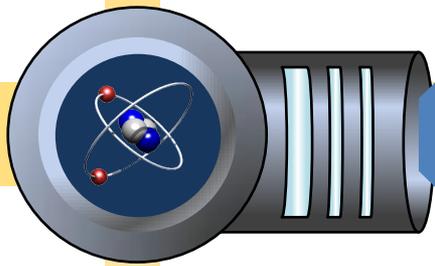
Wutball vs. Cindarella



Geschwindigkeit nach dem Stoß: **60 %**

Energie nach dem Stoß: **36 %**





Auf die Masse kommt es an...

Wutball



28 g

Heffalump



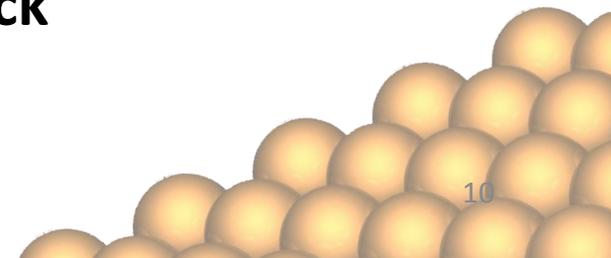
55 g

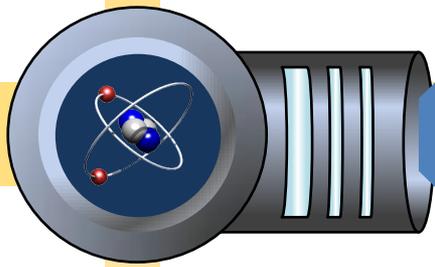
Cindarella



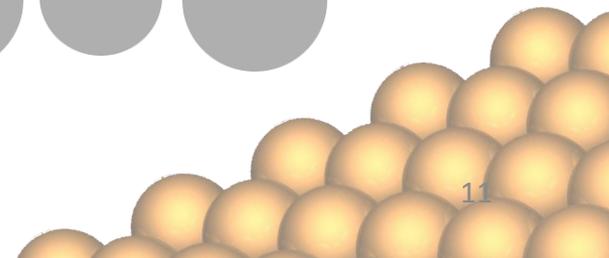
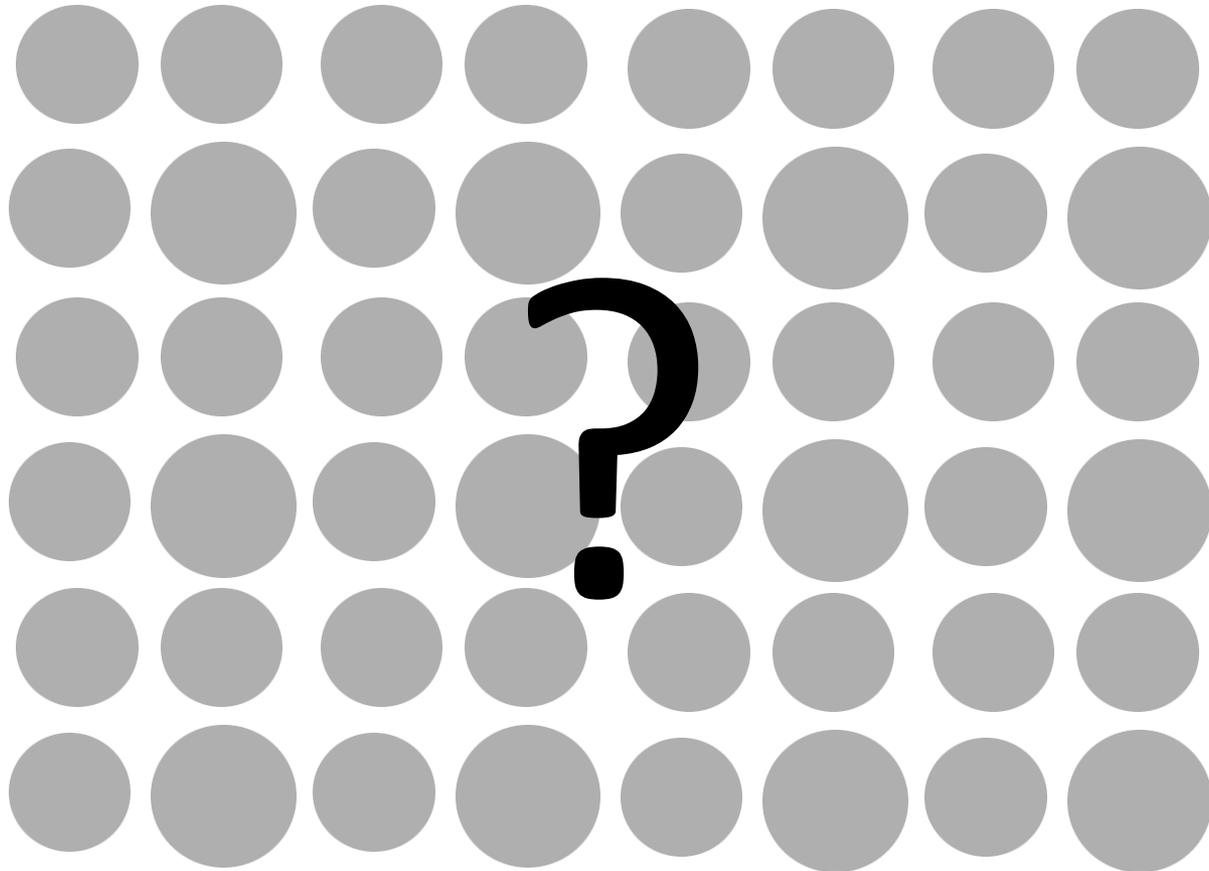
128 g

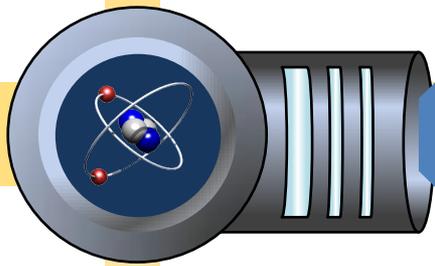
Je schwerer der Kollisionspartner, desto schneller kommt der Wutball zurück





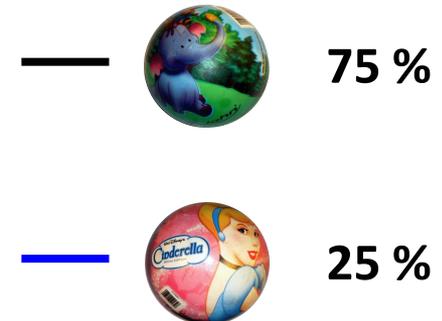
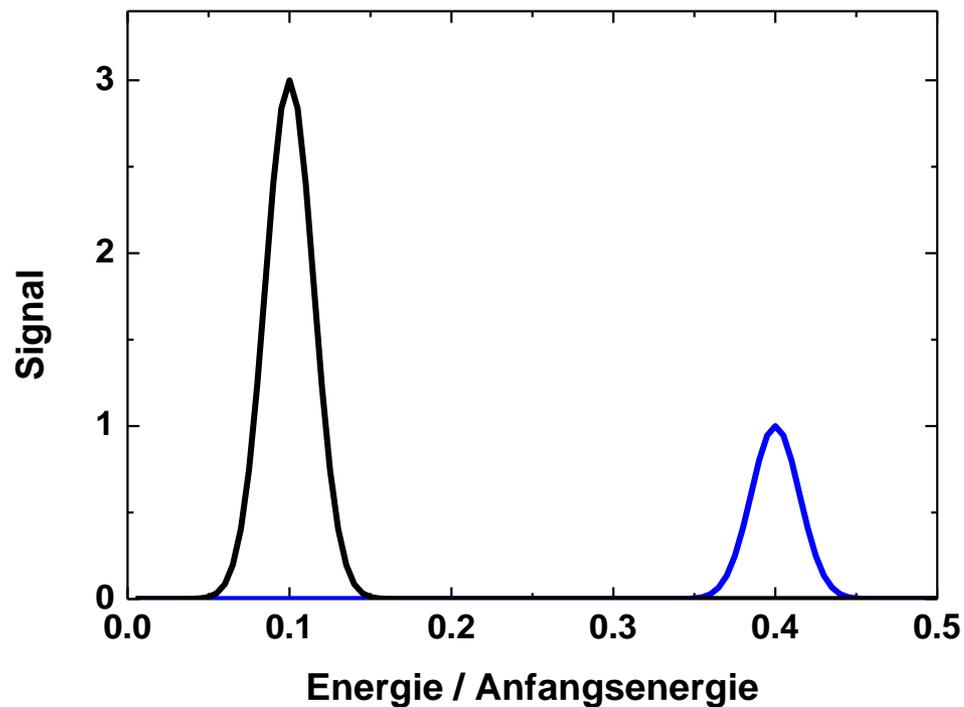
Was hat das mit Oberflächen zu tun?

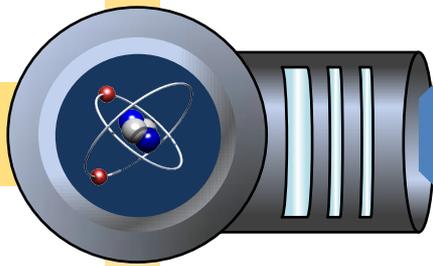




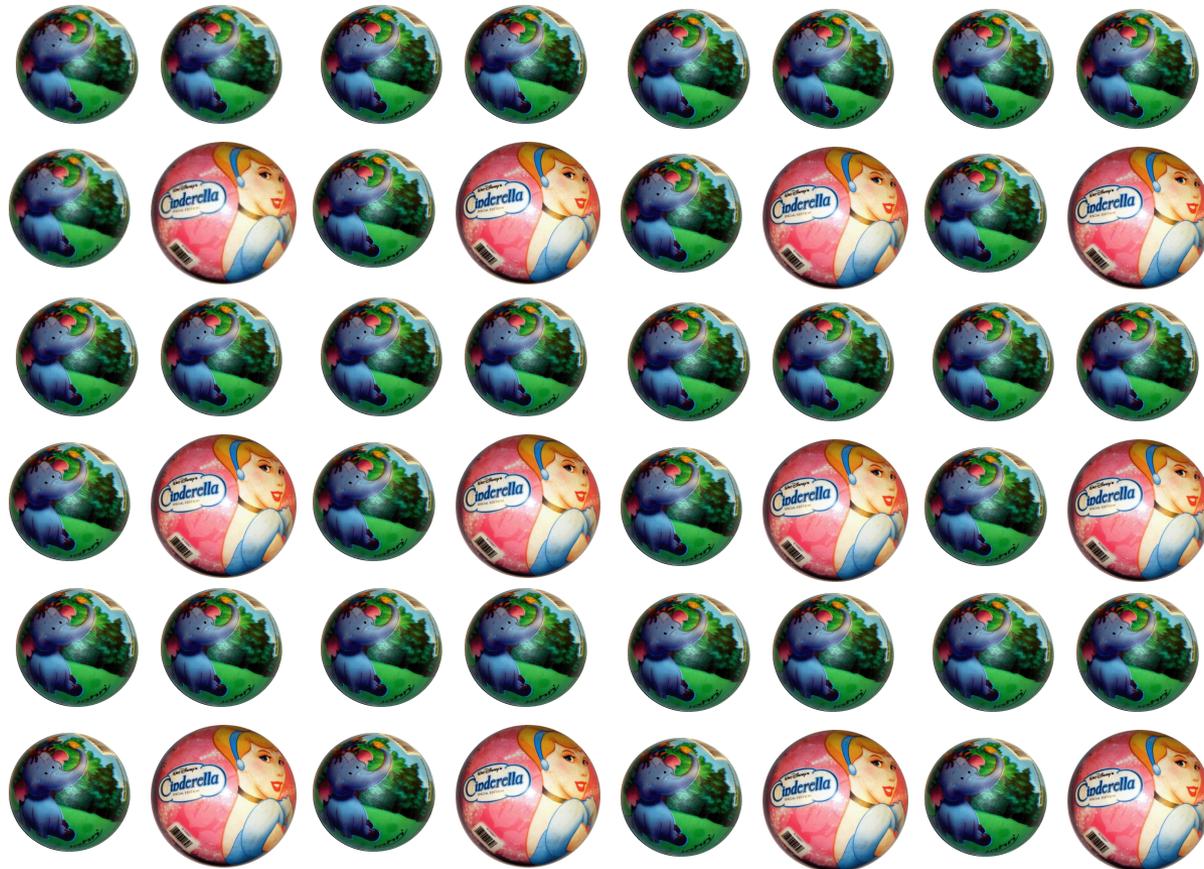
Ein anschauliches Beispiel

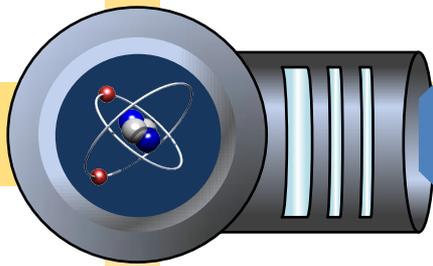
Das Ergebnis:



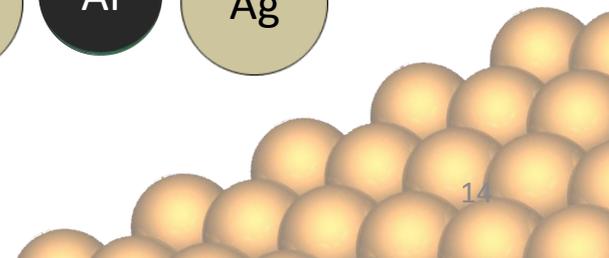
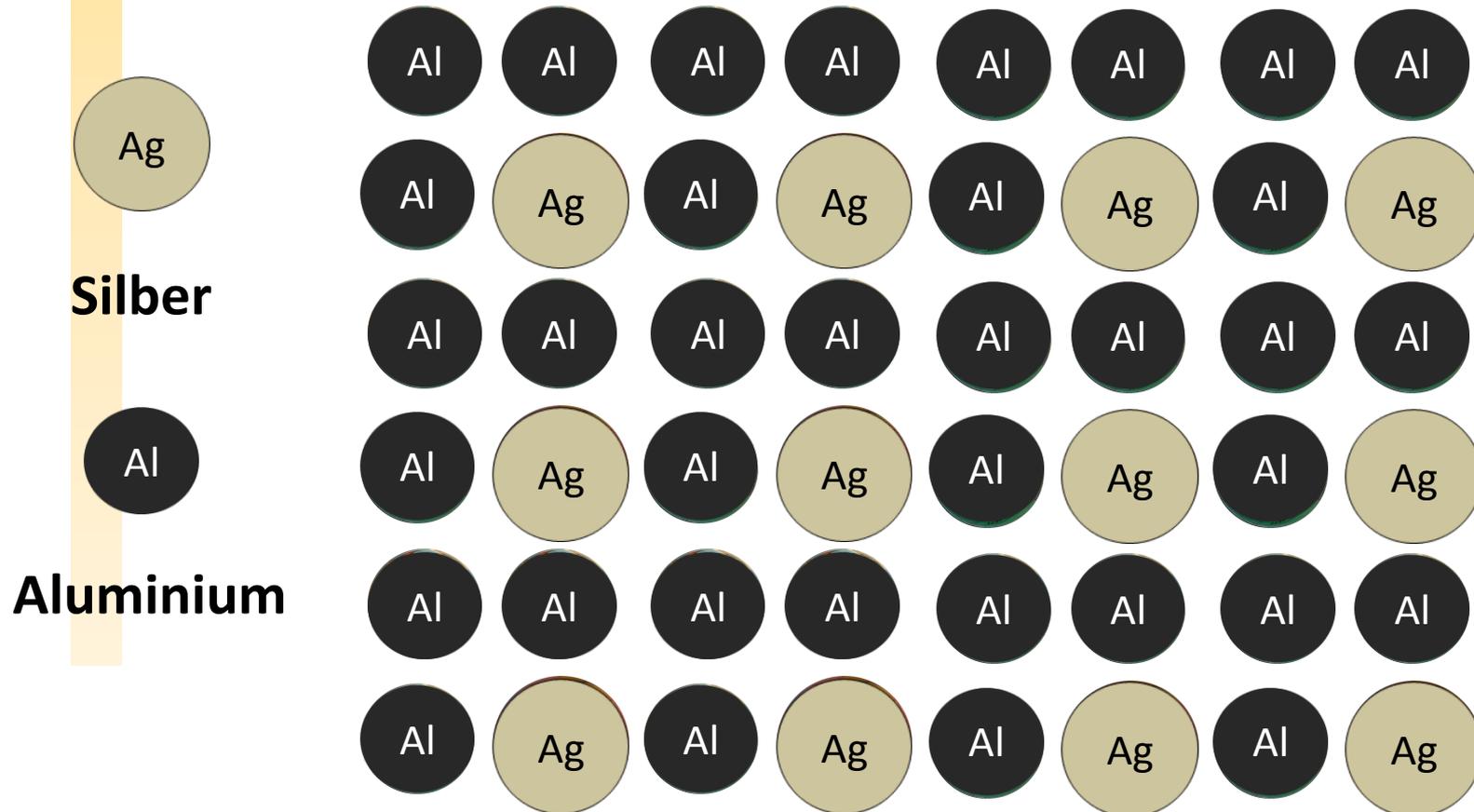


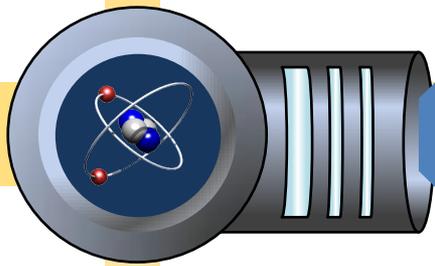
Ein anschauliches Beispiel





Ein anschauliches Beispiel





Ein anschauliches Beispiel

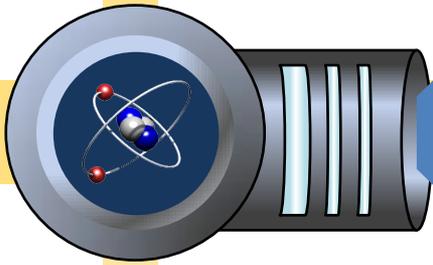
Ag

Silber

Al

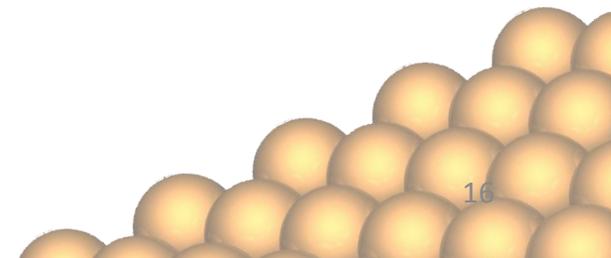
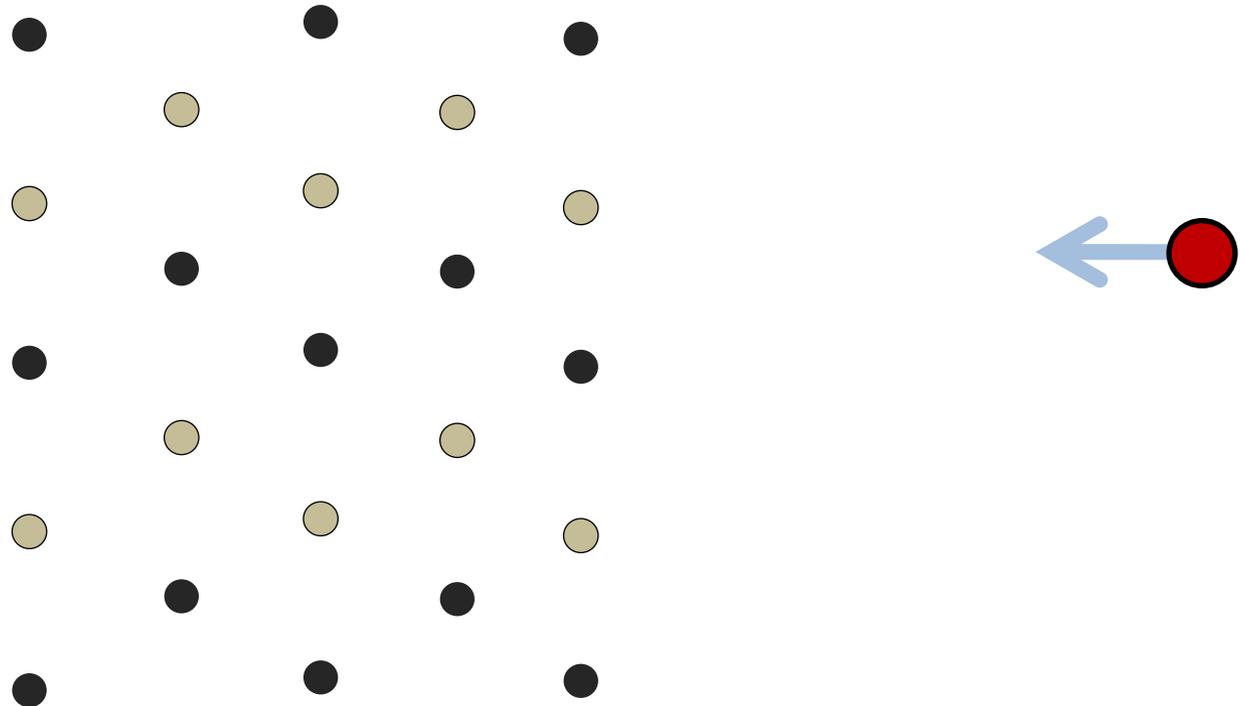
Aluminium

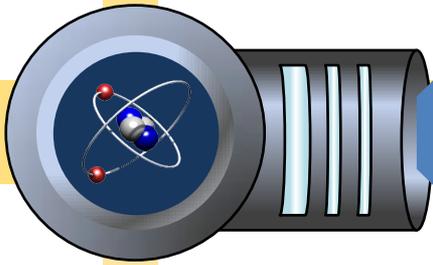




Etwas realistischer

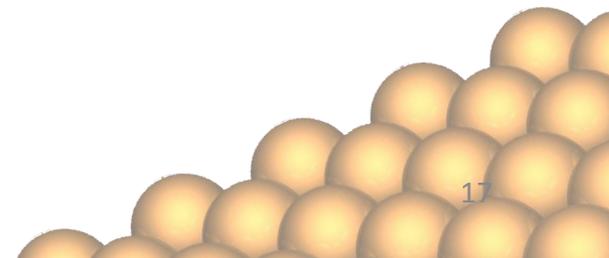
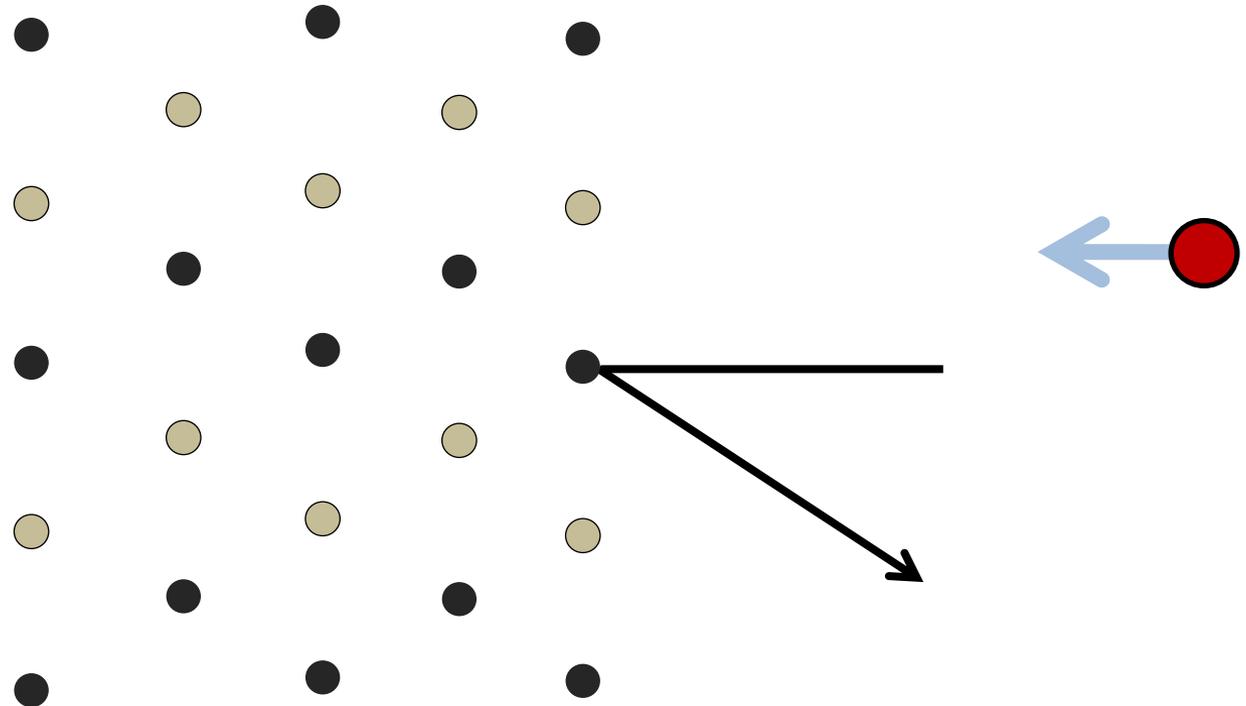
Es gibt mehr als nur 1 Atomlage!

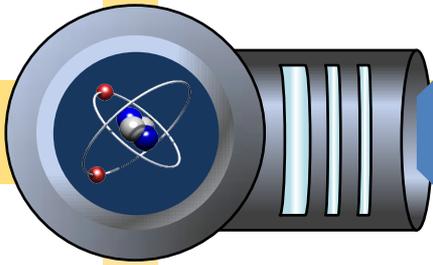




Etwas realistischer

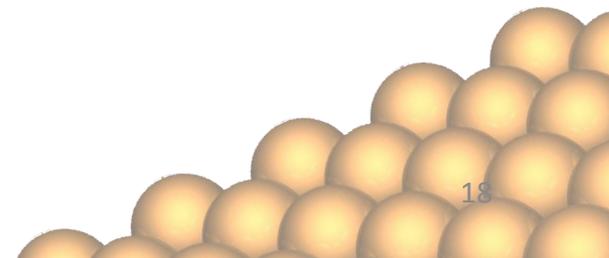
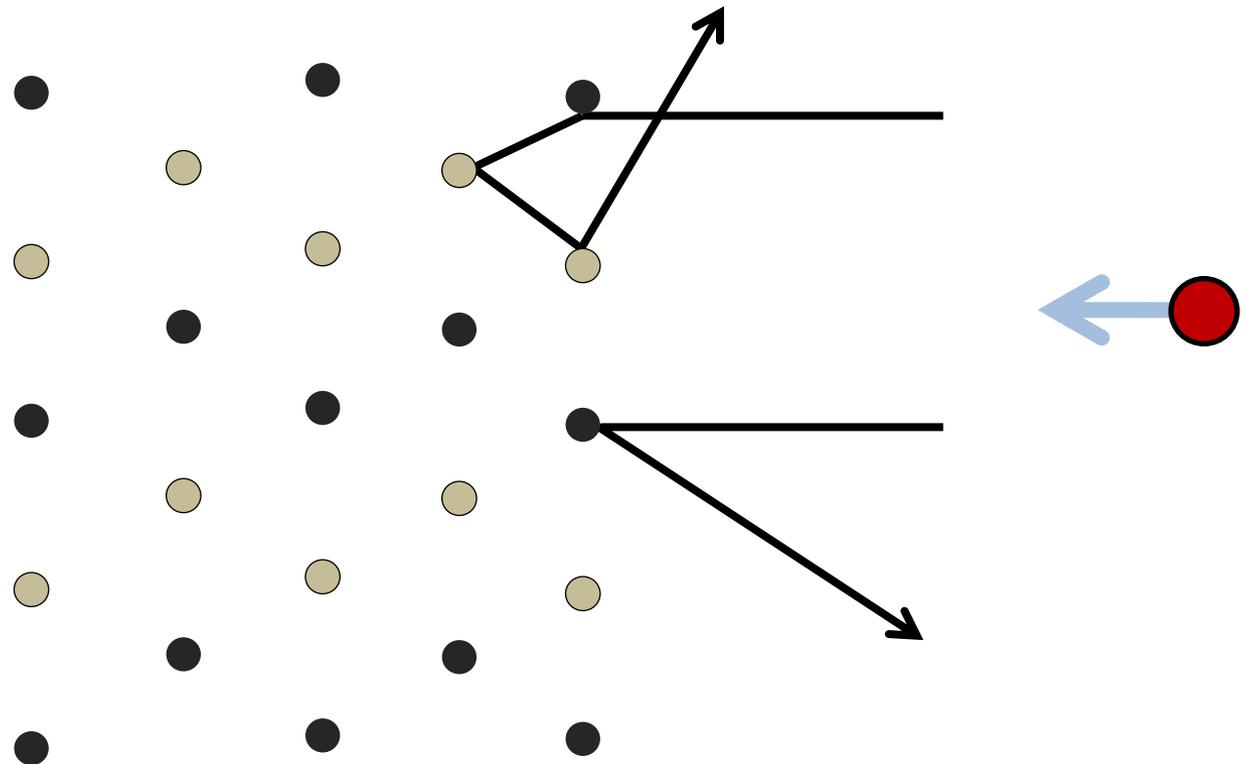
Es gibt mehr als nur 1 Atomlage!

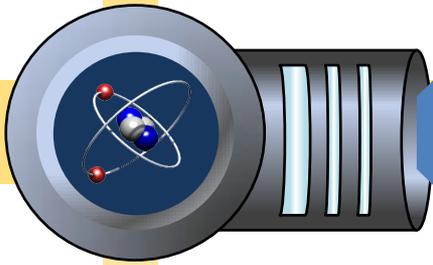




Etwas realistischer

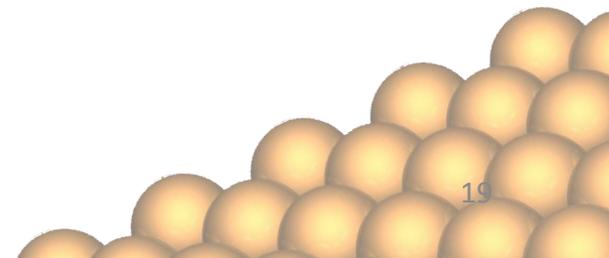
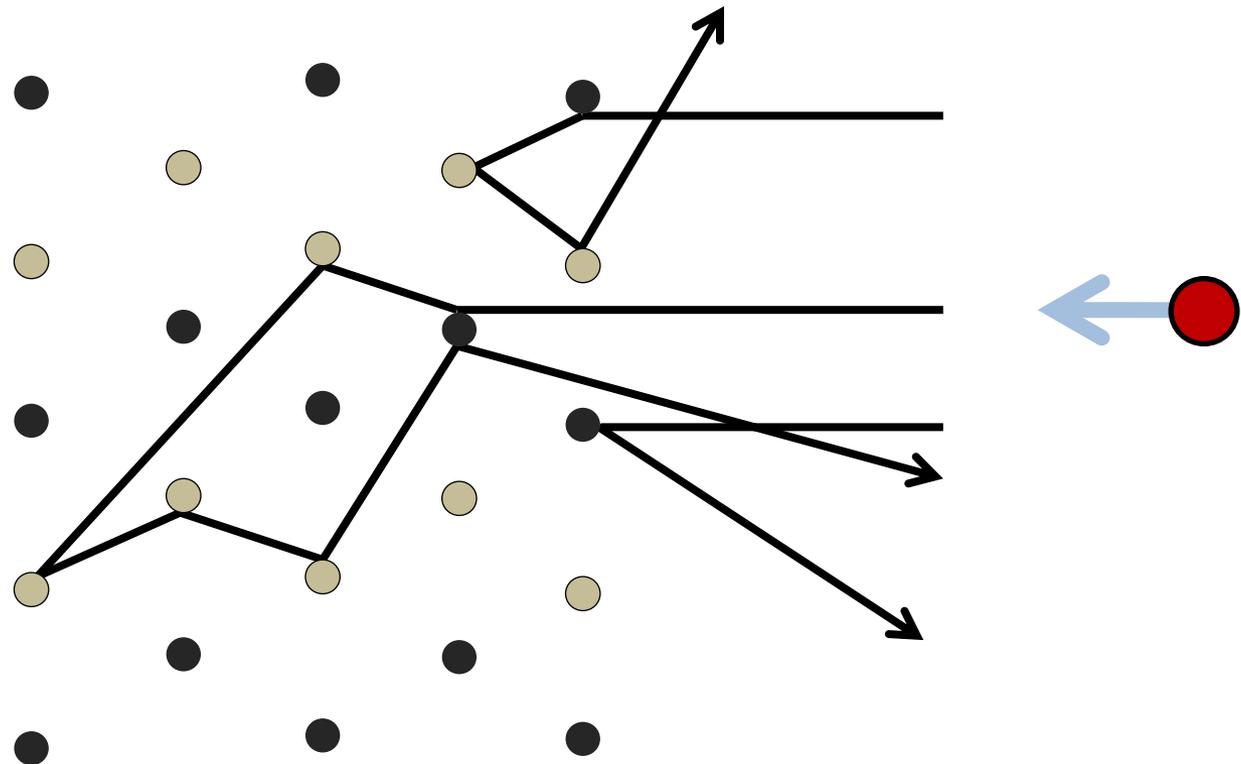
Es gibt mehr als nur 1 Atomlage!

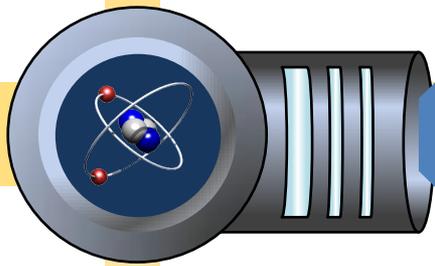




Etwas realistischer

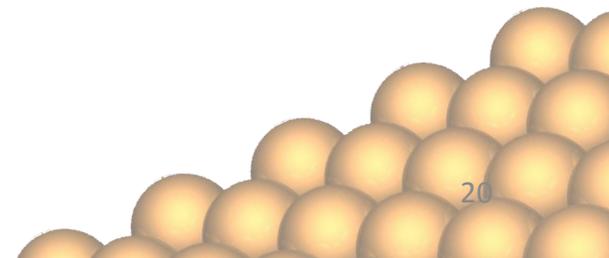
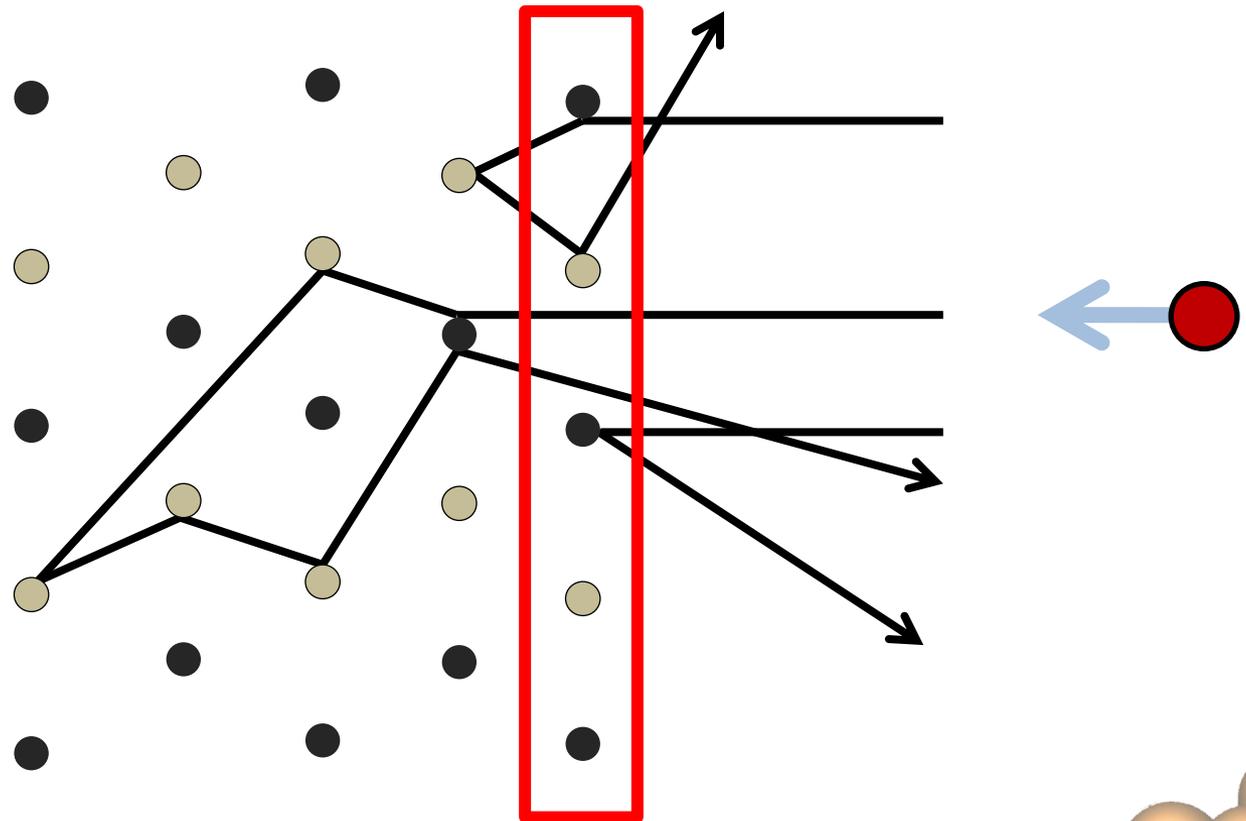
Es gibt mehr als nur 1 Atomlage!

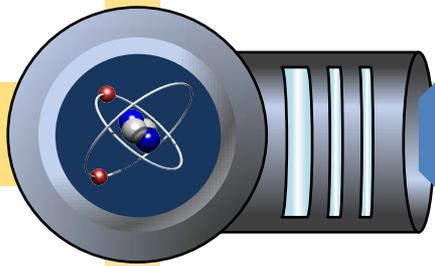




Etwas realistischer

Es gibt mehr als nur 1 Atomlage!

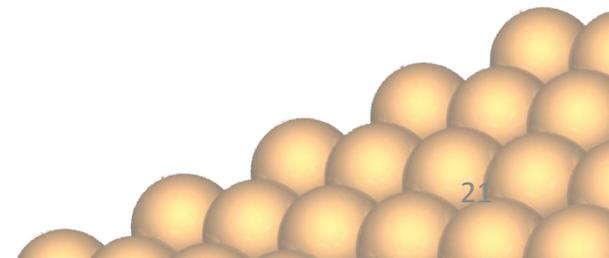


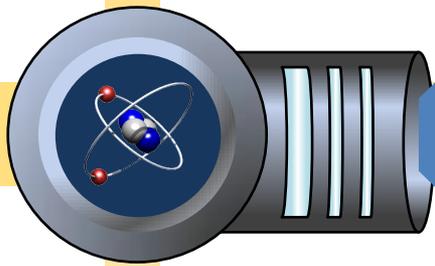


Die Lösung liegt im Projektil

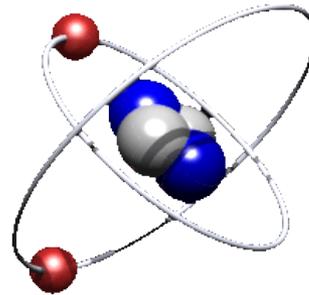


Wutball



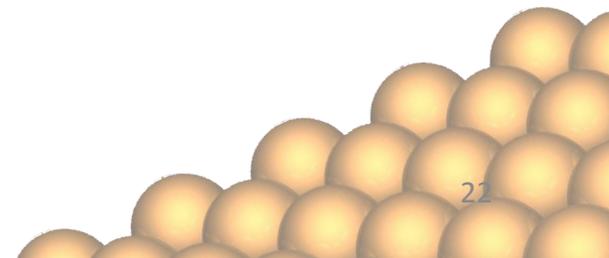


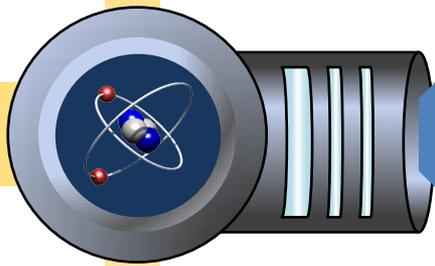
Die Lösung liegt im Projektil



Helium

**Helium ist ein Edelgas
es gibt sehr ungern Elektronen her**



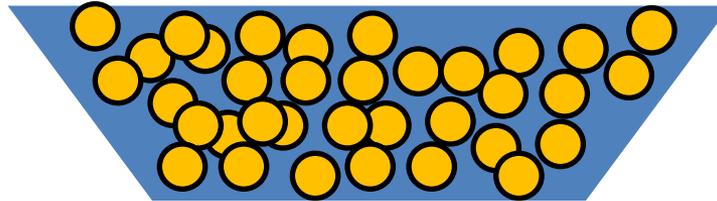


Was hat's mit der Ladung auf sich?

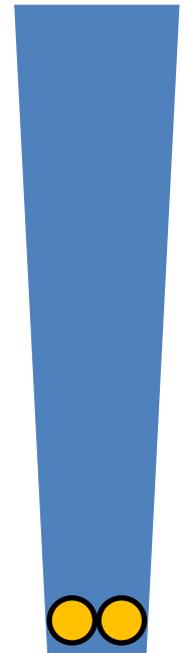
Energie



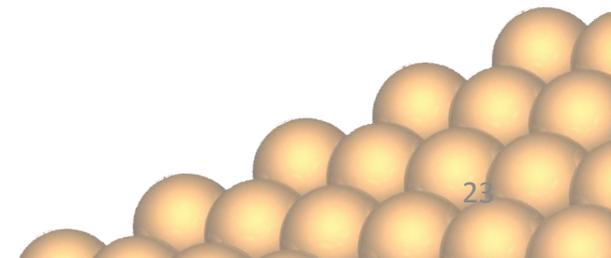
Metall

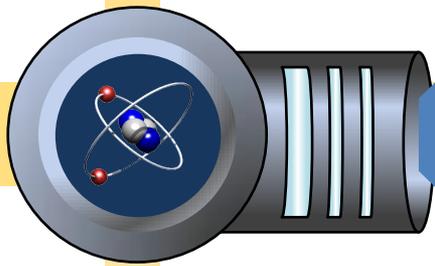


Helium



● Elektron



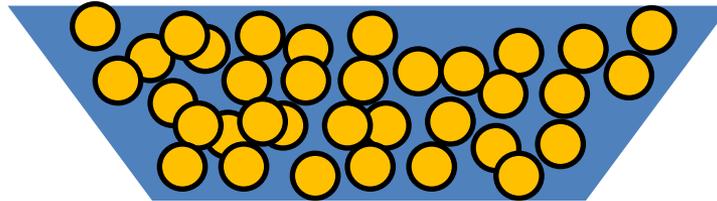


Was hat's mit der Ladung auf sich?

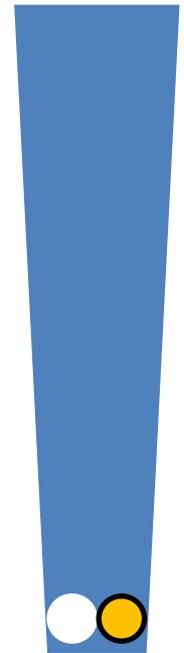
Energie



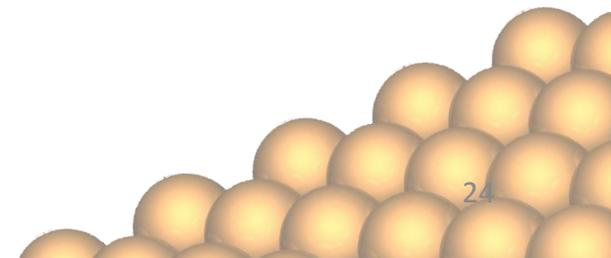
Metall

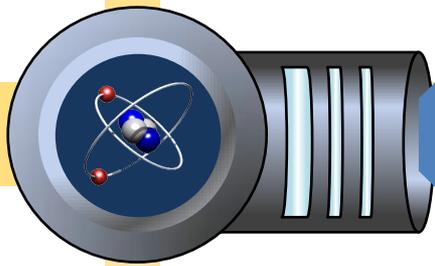


Helium-Ion



● Elektron





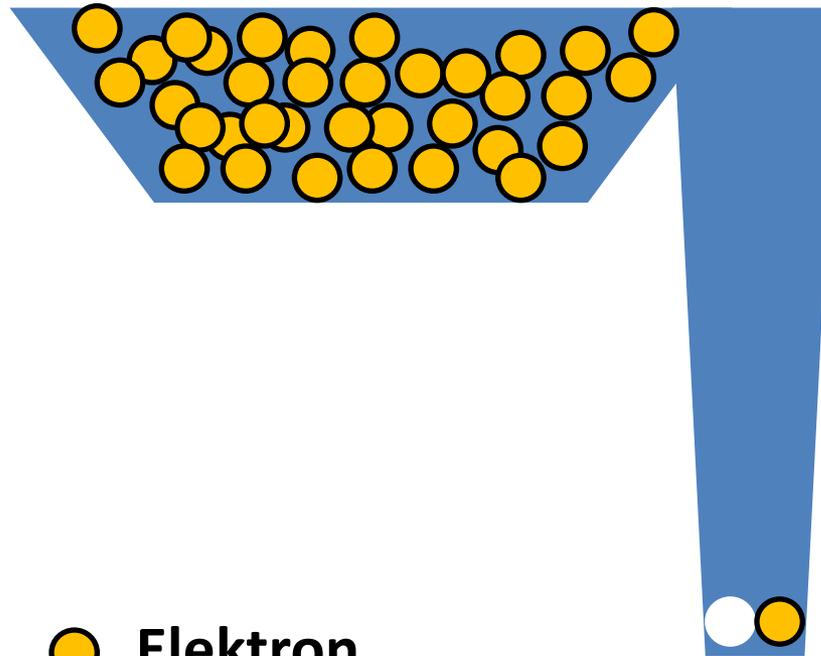
Was hat's mit der Ladung auf sich?

Energie

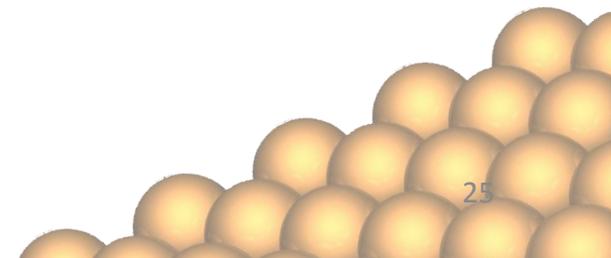


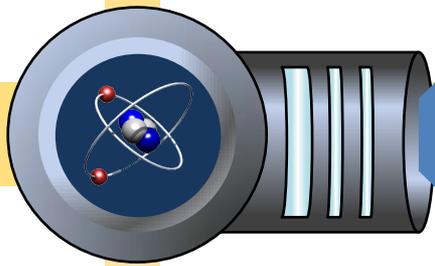
Metall

Helium-Ion



● Elektron



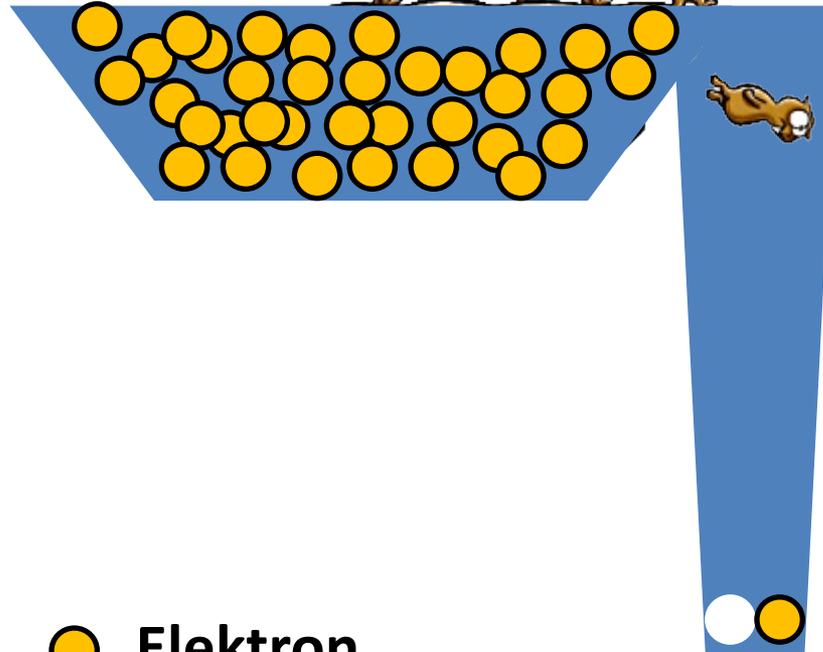


Was hat's mit der Ladung auf sich?

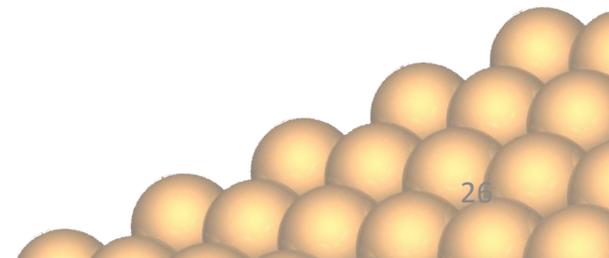
Energie

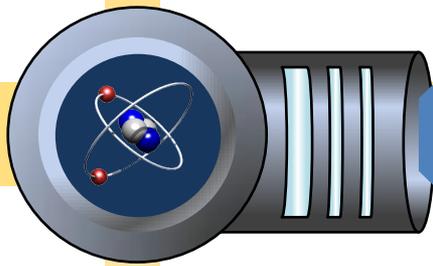


Metal Helium-Ion



● Elektron





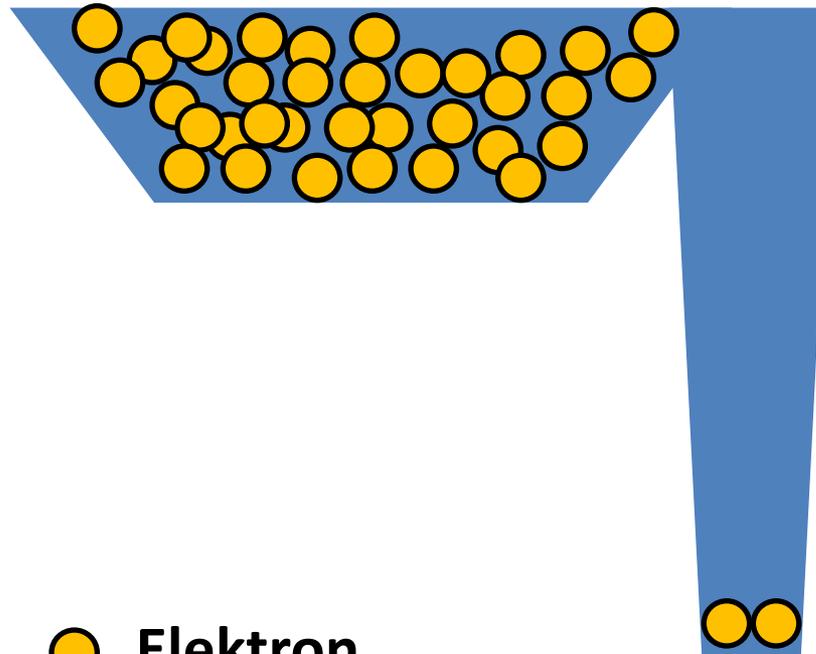
Was hat's mit der Ladung auf sich?

Energie

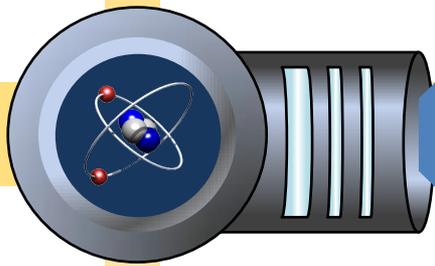


Metall

Helium



● Elektron

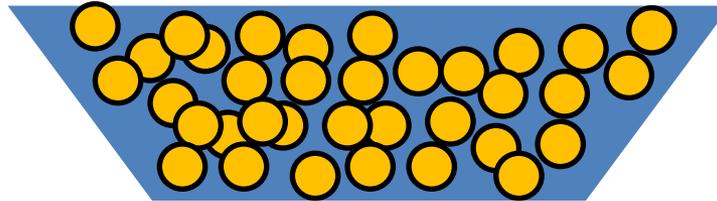


Was hat's mit der Ladung auf sich?

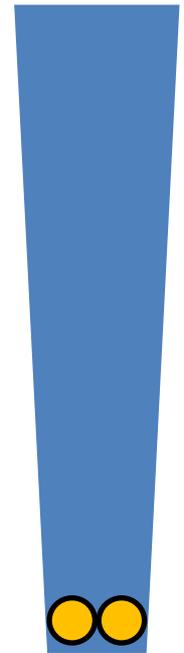
Energie



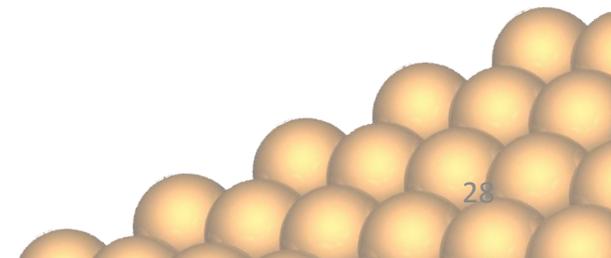
Metall

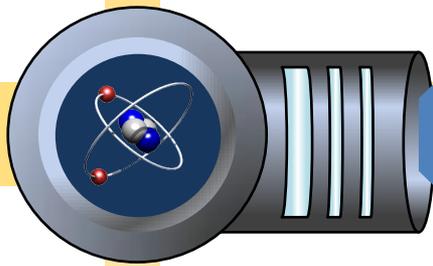


Helium



● Elektron



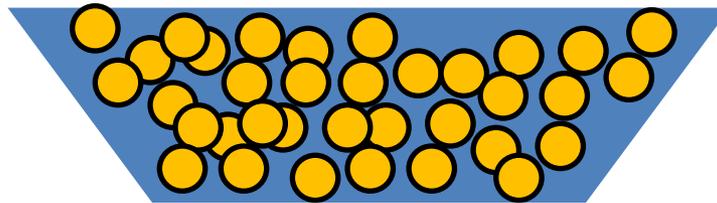


Was hat's mit der Ladung auf sich?

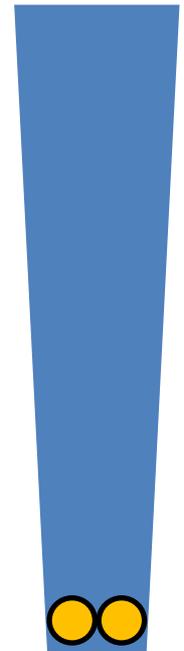
Energie



Metall

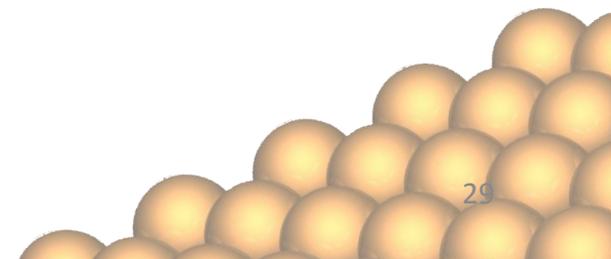


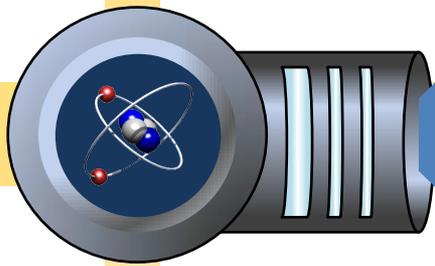
Helium



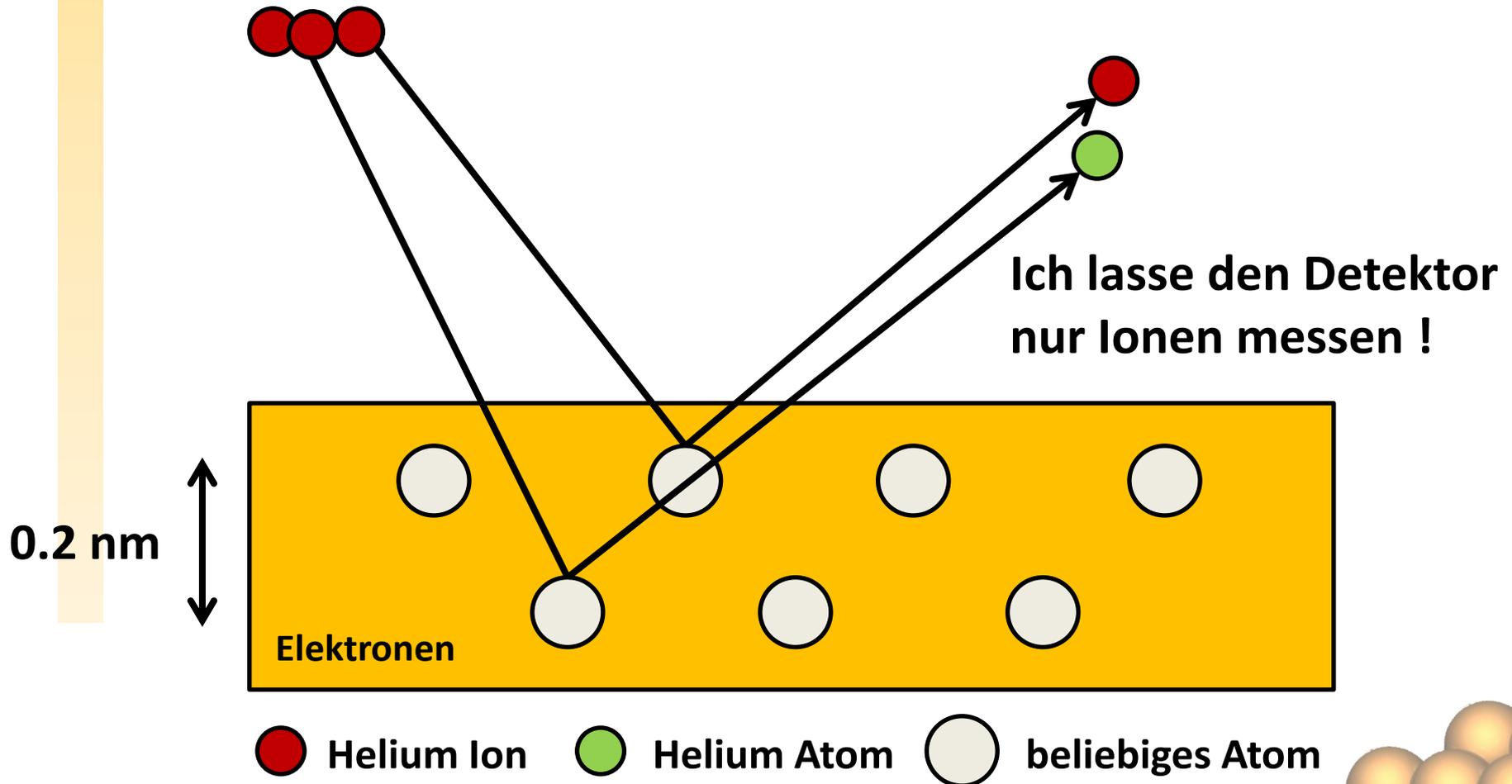
● Elektron

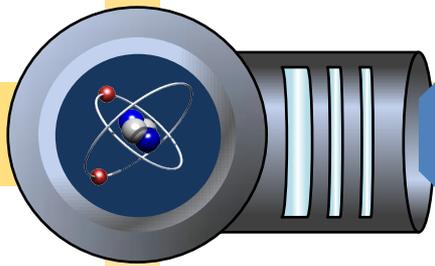
In der Nähe einer Oberfläche, wird ein Helium-Ion sehr schnell neutralisiert



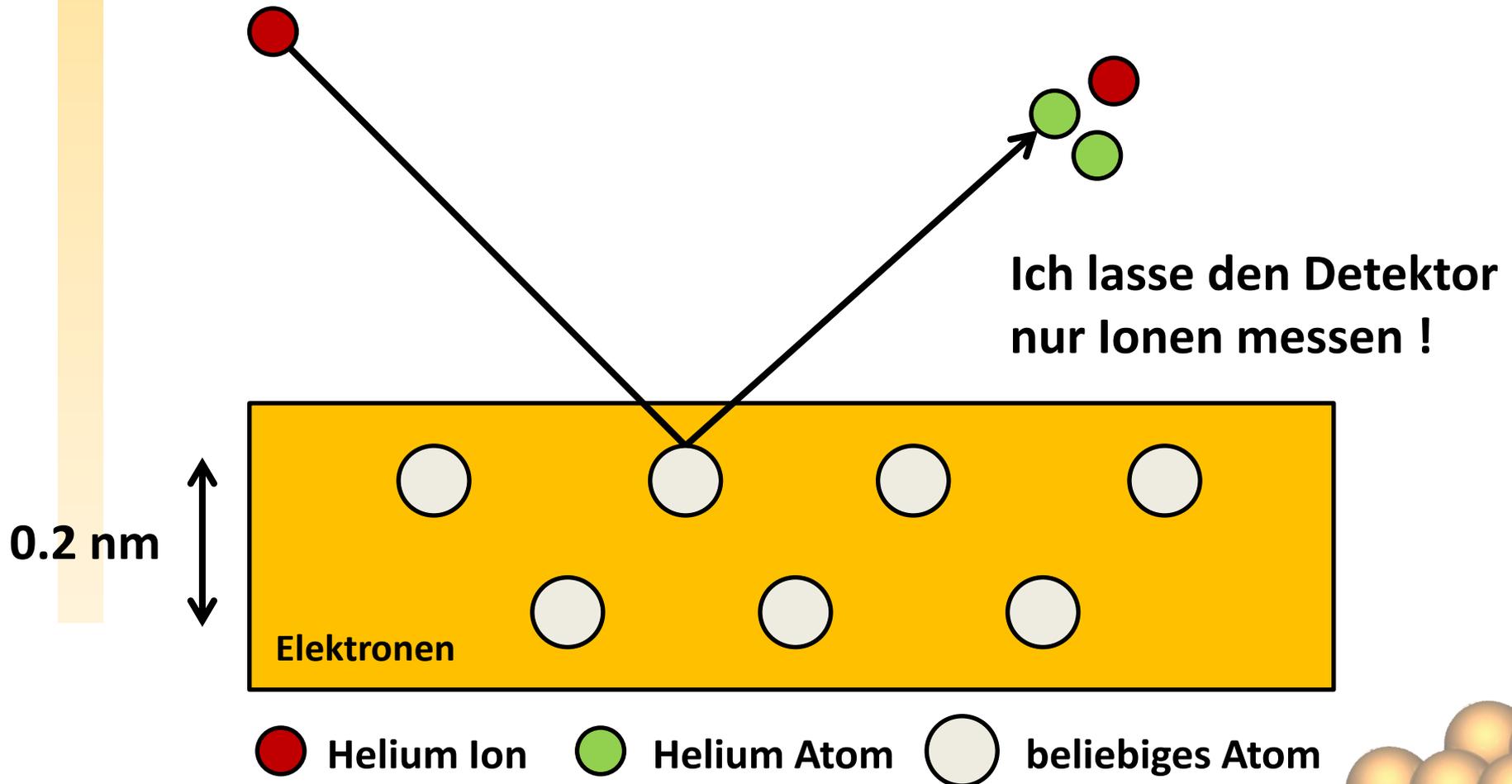


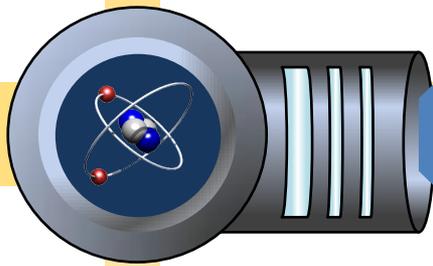
Wer überlebt den Zusammenstoß?





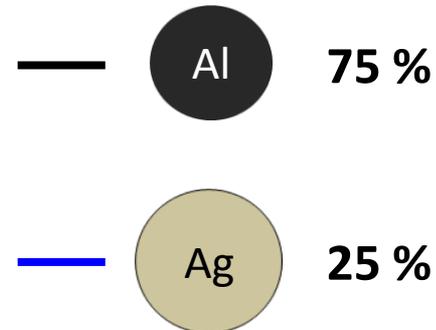
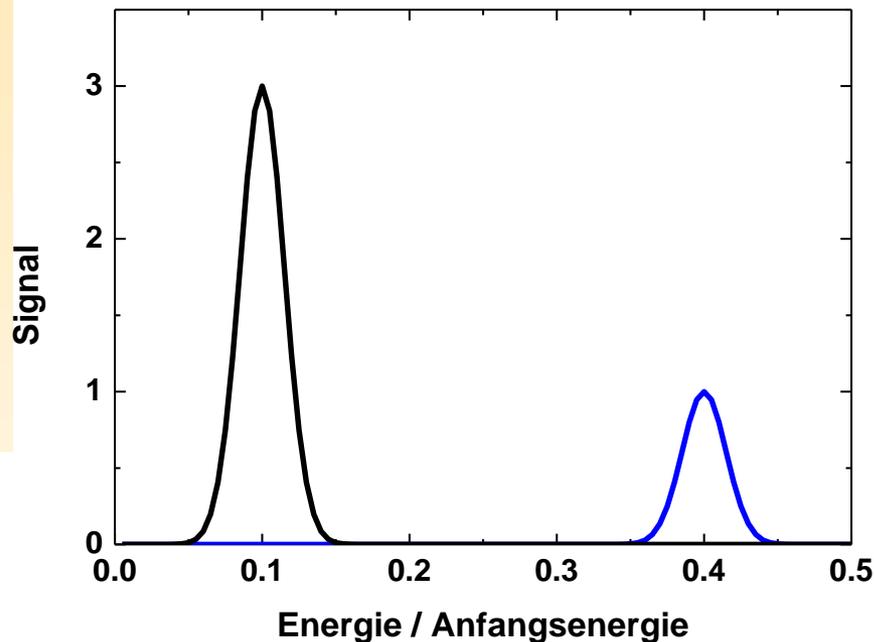
Wer überlebt den Zusammenstoß?

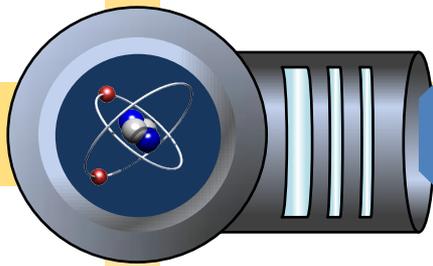




Silber: Elektronen sind mein Schatz

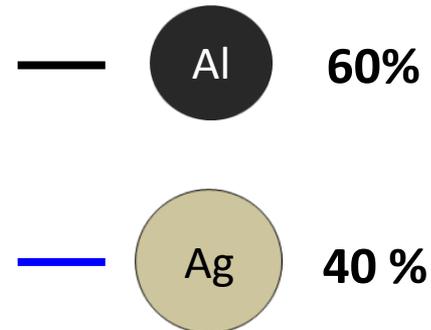
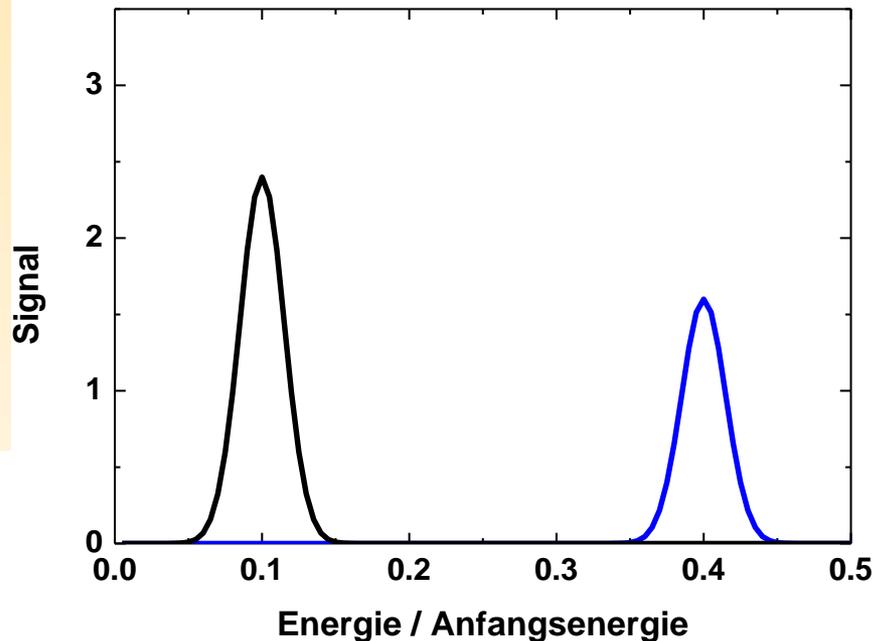
Angenommen, Silber gibt nur halb so viele Elektronen her wie Aluminium...

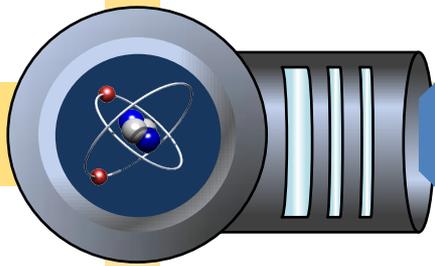




Silber: Elektronen sind mein Schatz

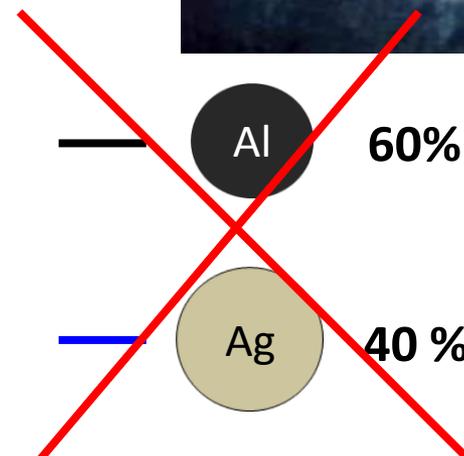
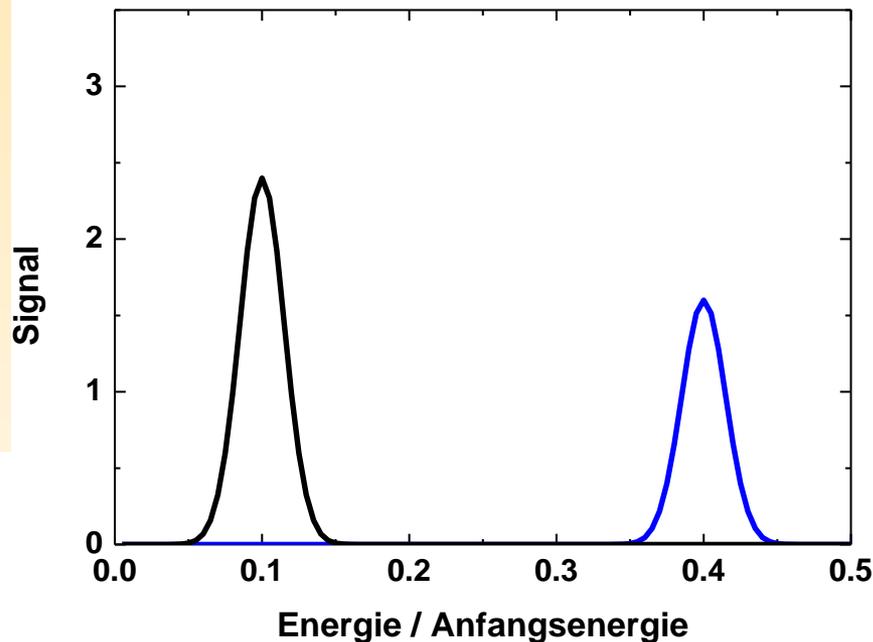
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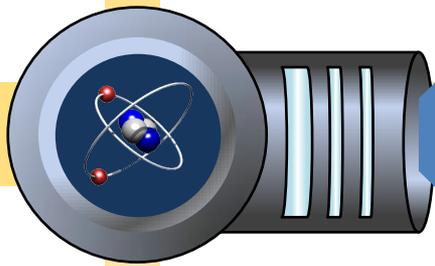




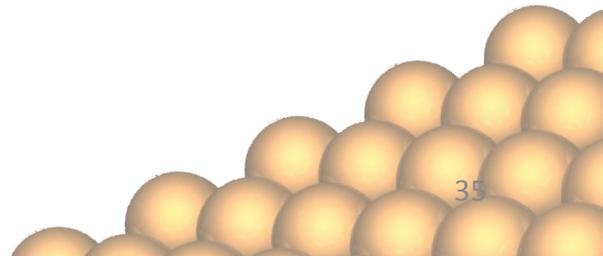
Silber: Elektronen sind mein Schatz

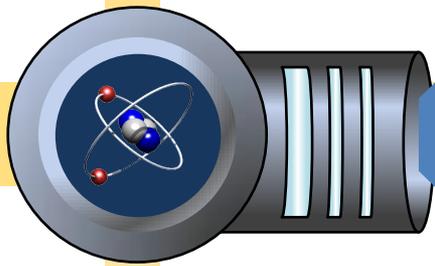
Angenommen, Silber gibt nur halb so viele Elektronen her wie Aluminium...





**Wissen über Neutralisation
ist sehr wichtig!**



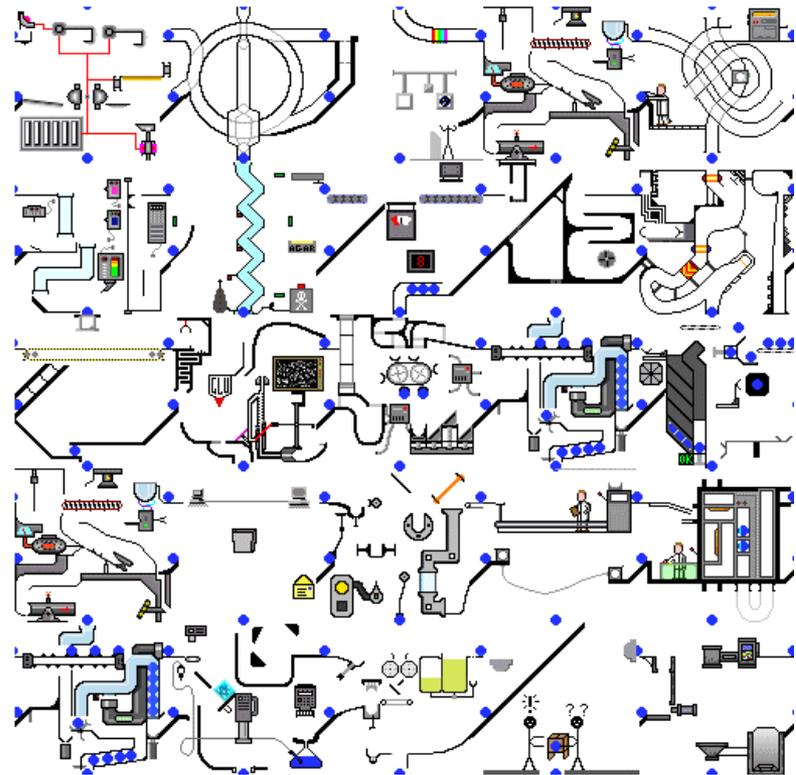


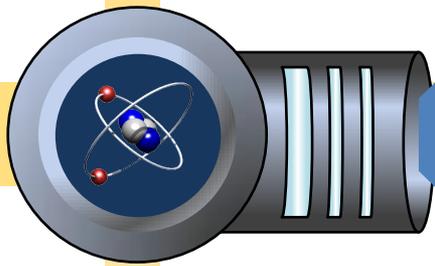
Simulation von Ladungsaustausch

Was bringt eine Computersimulation?

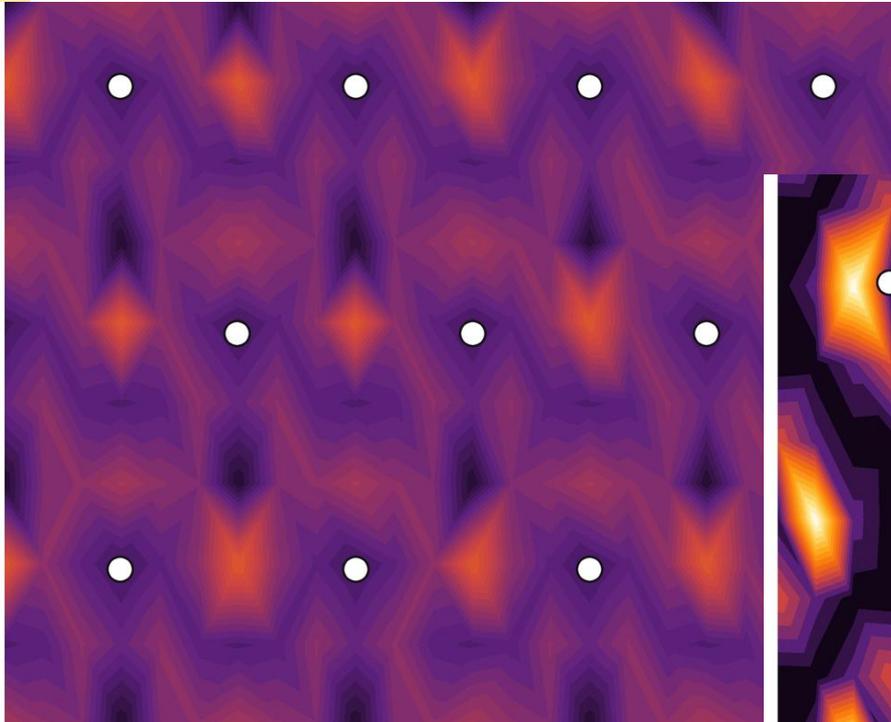
Ergebnisse

Materialeigenschaften



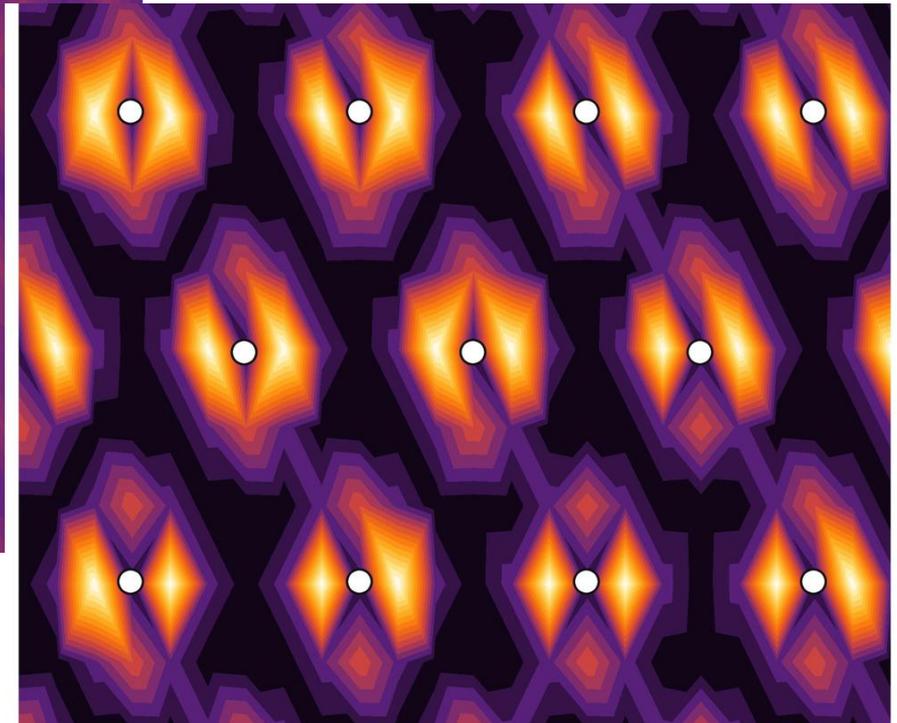


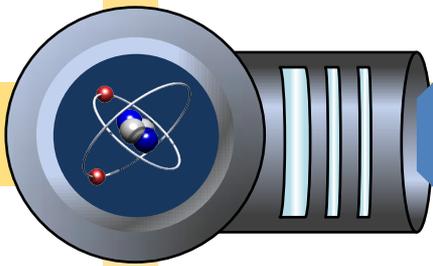
Vergleich Silber / Aluminium



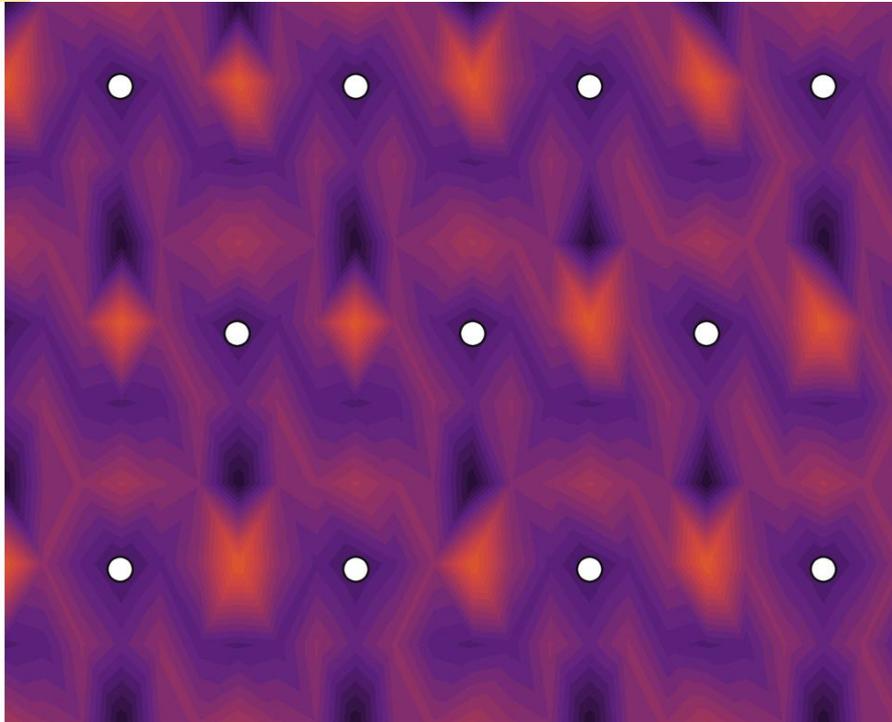
Aluminium

Silber



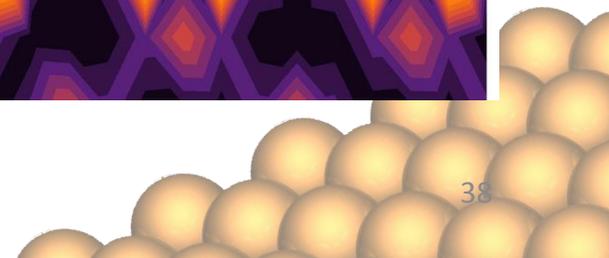
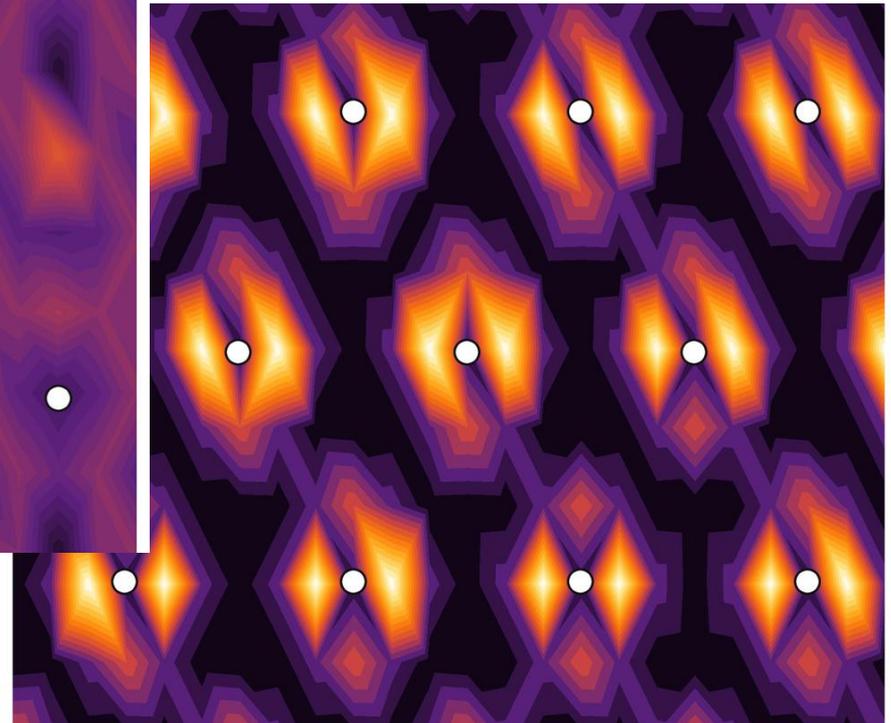


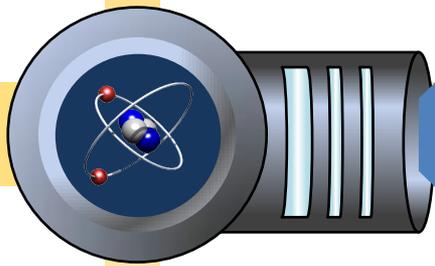
Vergleich Silber / Aluminium



Aluminium

Silber



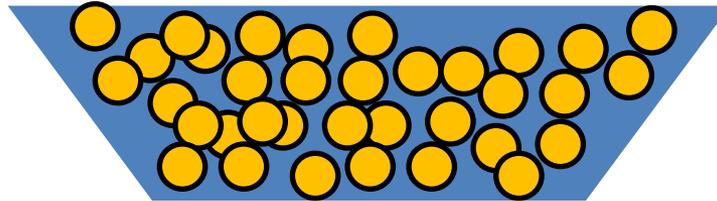


Ein wichtiger Parameter

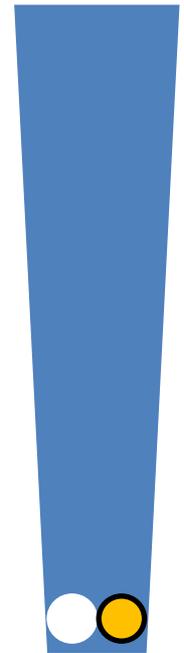
Energie



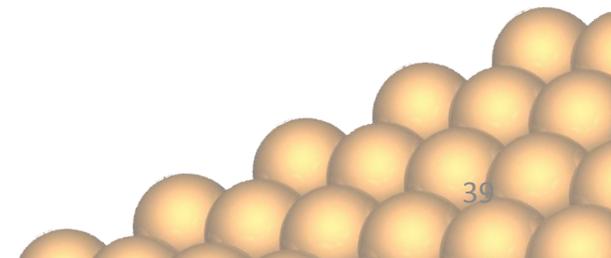
Metall

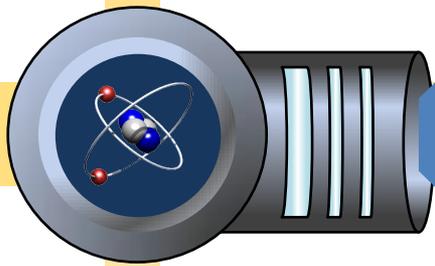


Helium-Ion



● Elektron





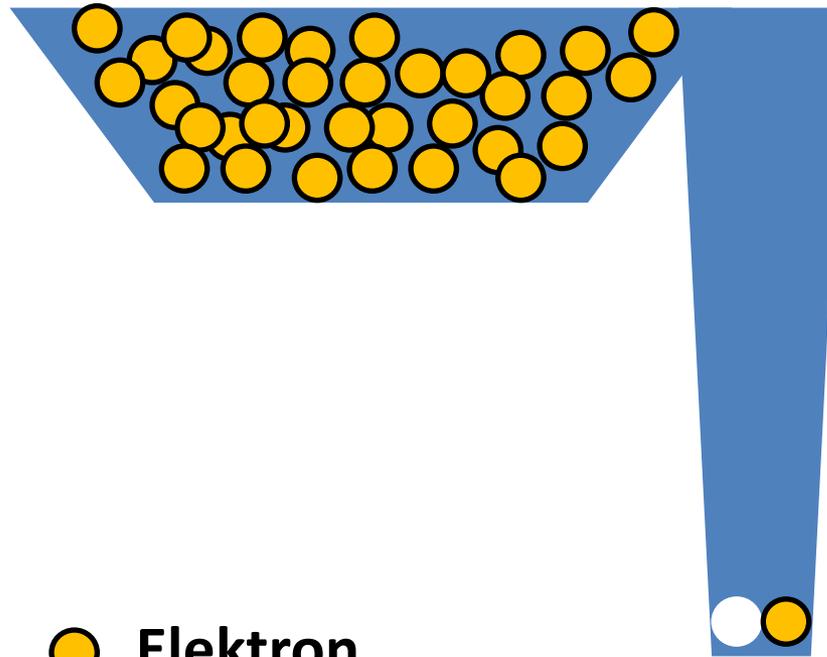
Ein wichtiger Parameter

Energie

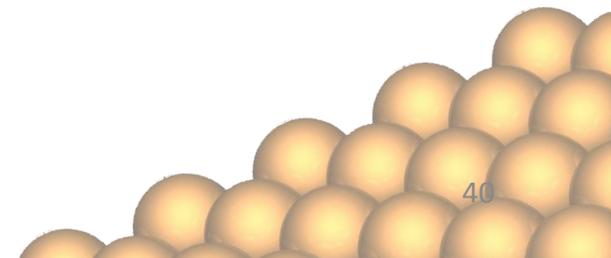


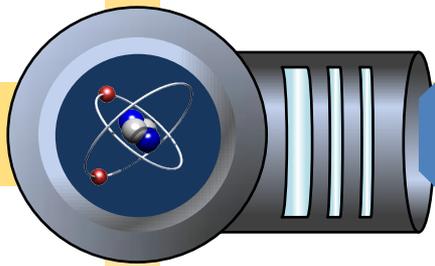
Metall

Helium-Ion



● Elektron





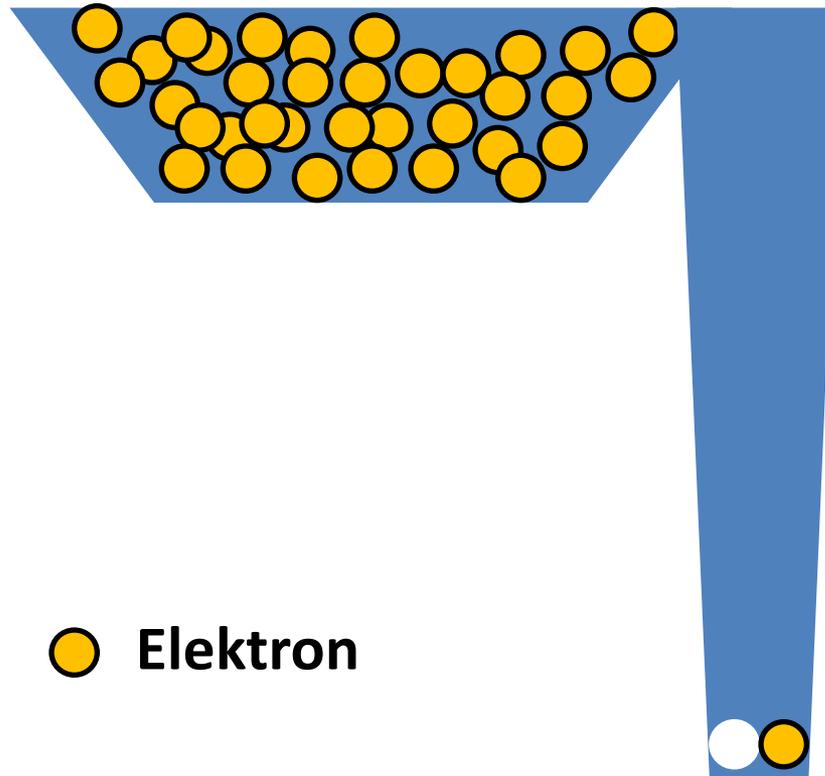
Ein wichtiger Parameter

Energie

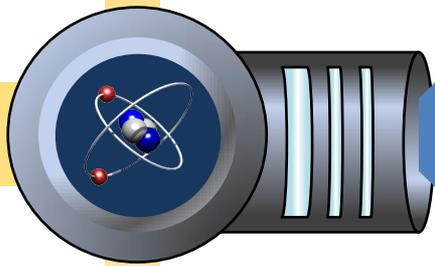


Metall

Helium-Ion



● Elektron



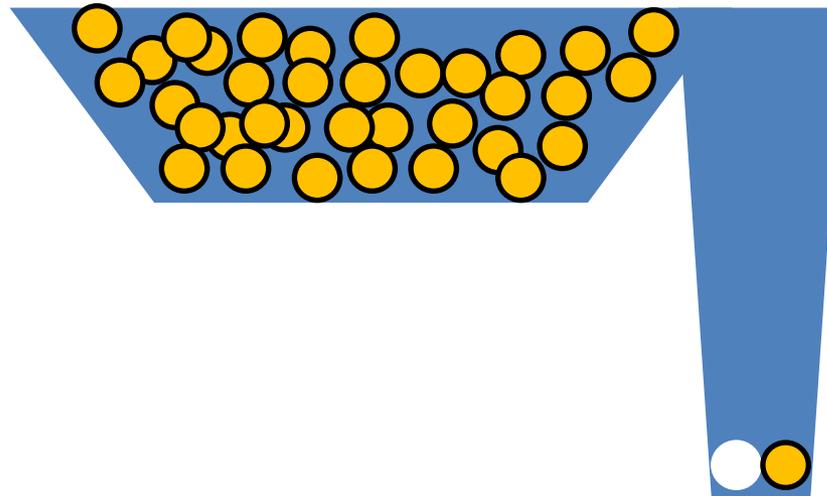
Ein wichtiger Parameter

Energie

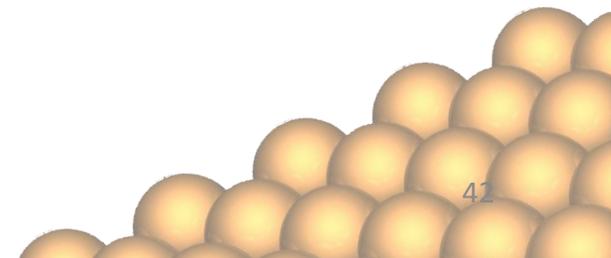


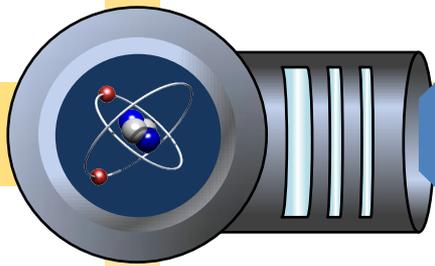
Metall

Helium-Ion



● Elektron





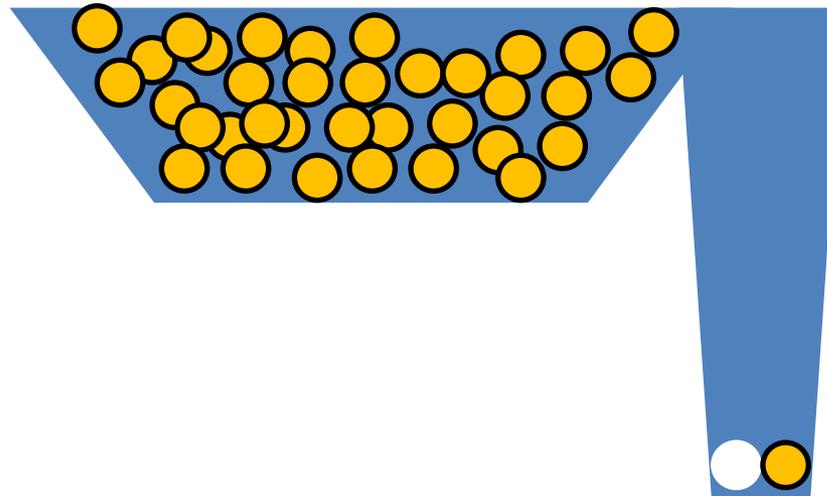
Ein wichtiger Parameter

Energie



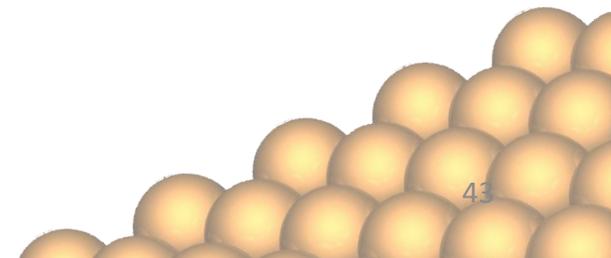
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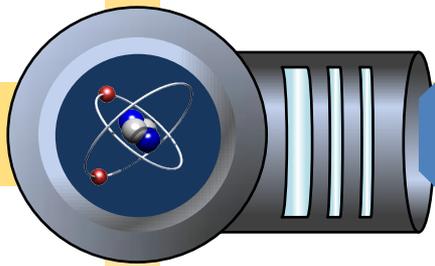
Helium-Ion



● Elektron

10 % tiefer → 50 % weniger Ionen



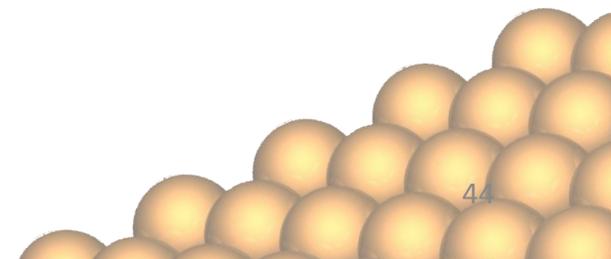


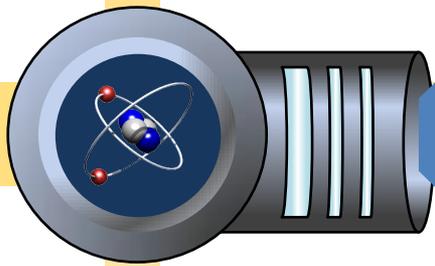
Wie gut ist die Methode?

Diese Methode ist extrem sensibel!



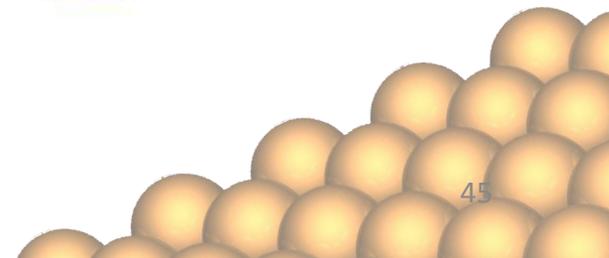
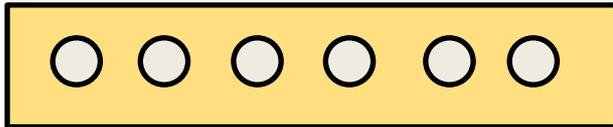
Gold: 1 Reiskorn pro kg Reis

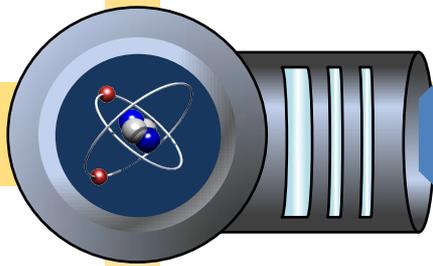




Wie gut ist die Methode?

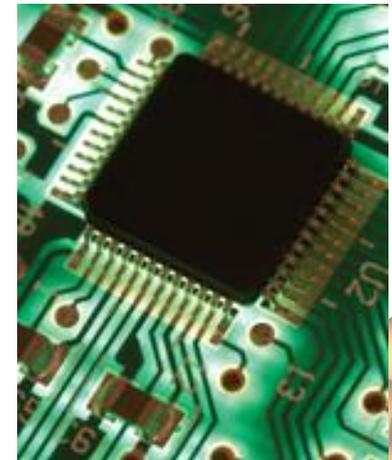
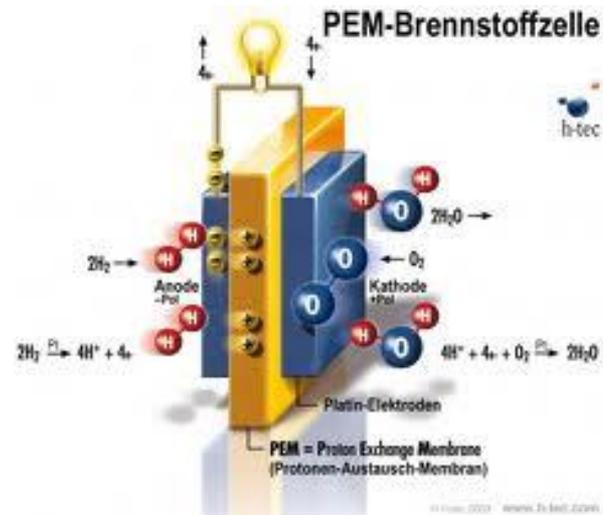
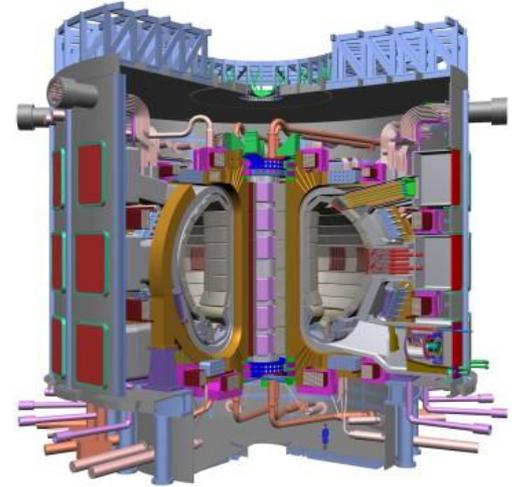
Diese Methode ist empfindlich auf 1ste Atomlage!

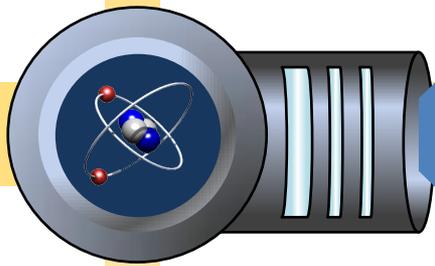




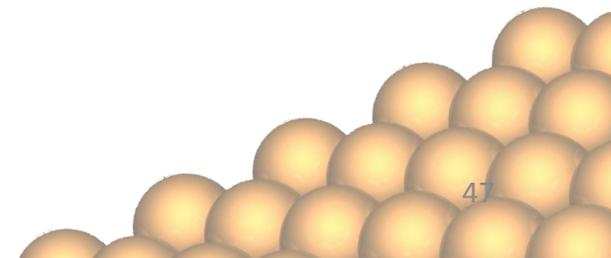
Wofür wird die Methode eingesetzt?

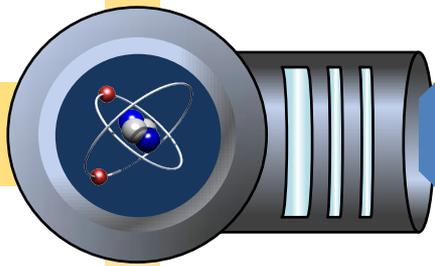
- Kernfusion
- Halbleiterindustrie
- Brennstoffzellen
- Katalysatoren
- Bodenwachs
- Schokoriegel
- Zahnmedizin



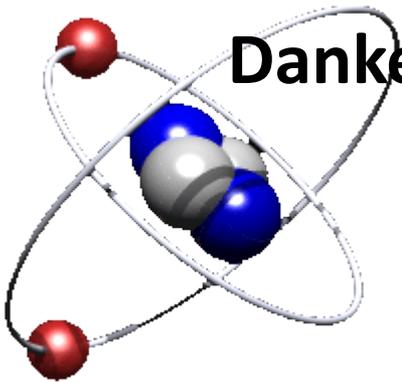


Physik ist nichts für Einzelkämpfer





Laden und Feuern



Danke für eure Aufmerksamkeit!

Gibts Fragen?

