

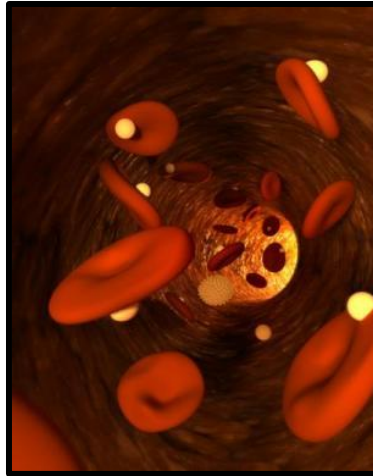


FÁZISSZÉTVÁLÁS ÖTVÖZET NANOSZEMCSÉKBEN

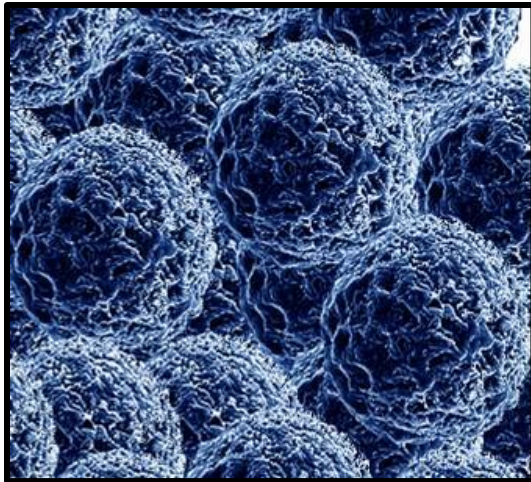
Bokányi Eszter
Fizika BSc III. évf.

Témavezető: Dr. Misják Fanni
MTA MFA Vékonyréteg-fizikai osztály

NANOSZEMCSÉK MINDENÜTT

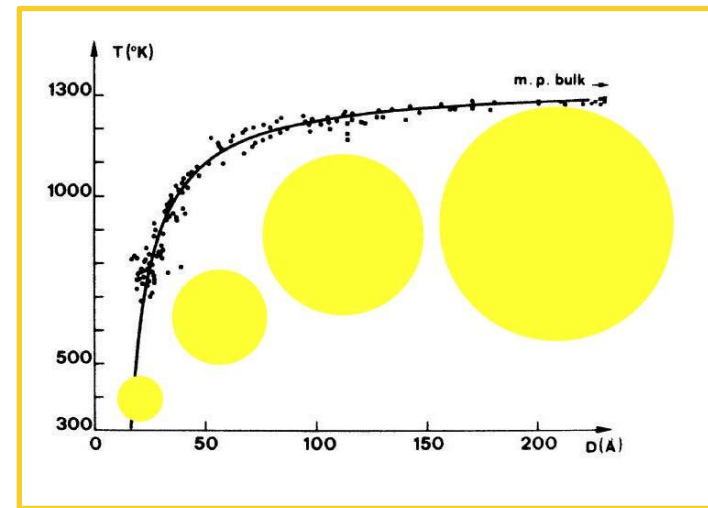


- bevonatok
- katalizátorok
- orvosi alkalmazás
- festékanyagok – méreteffektus!

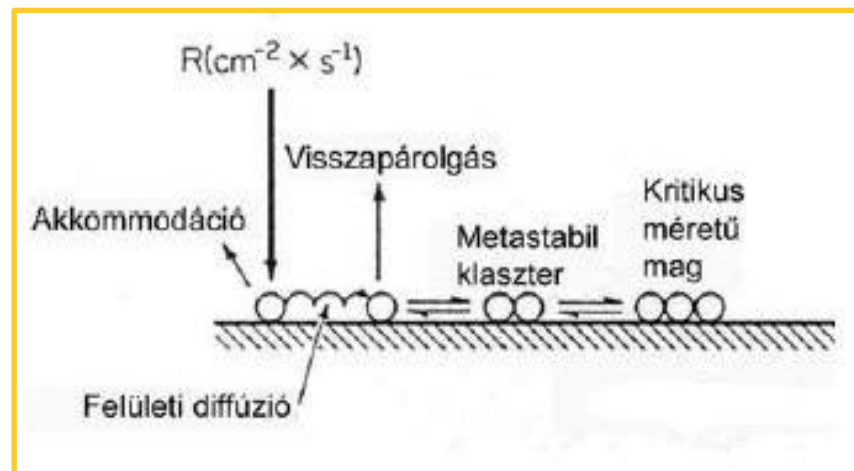


NANOSZEMCSÉK TULAJDONSÁGAI, ELŐÁLLÍTÁSUK

- Olvadáspont-csökkenés
- Felületi feszültség, belső nyomás
- Egyensúlyi alak

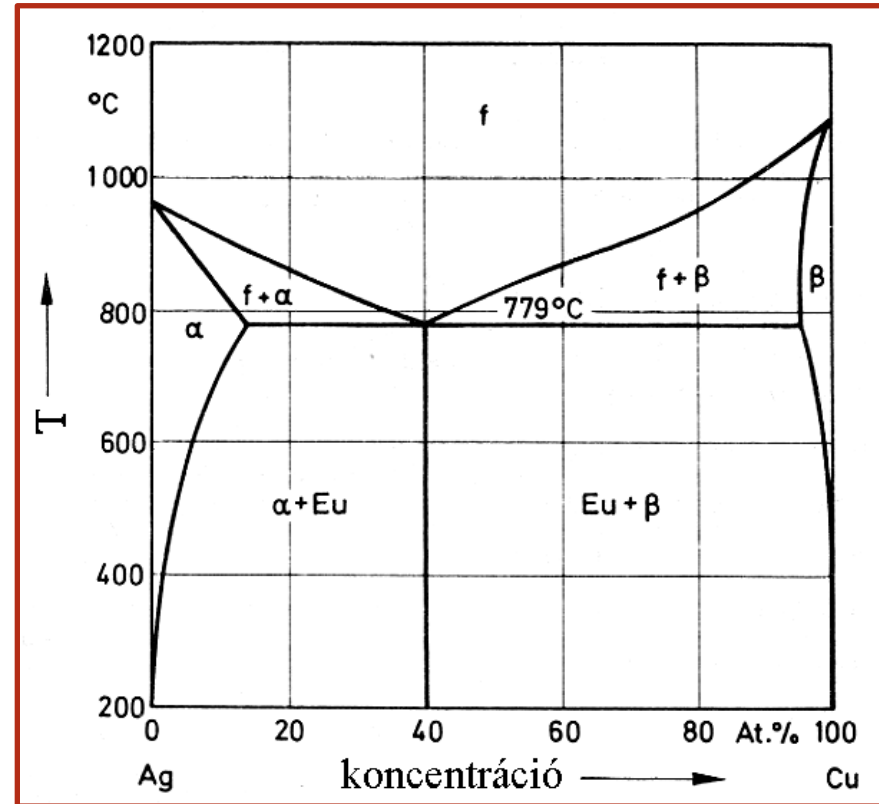
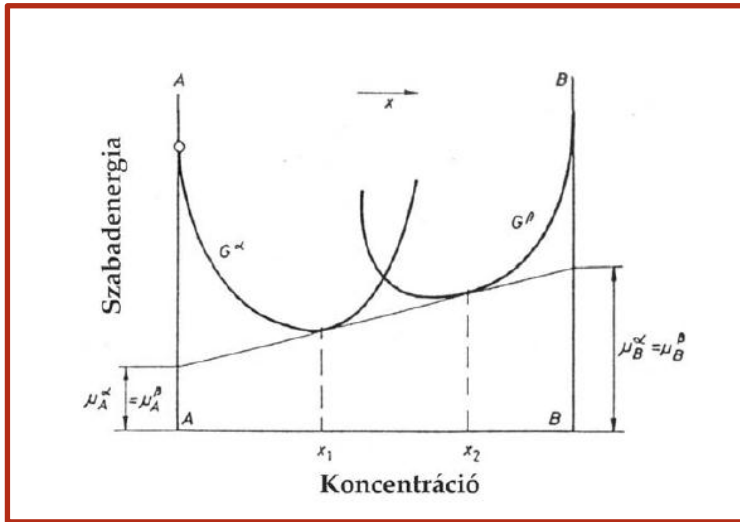


- Magképződés és koaleszcencia

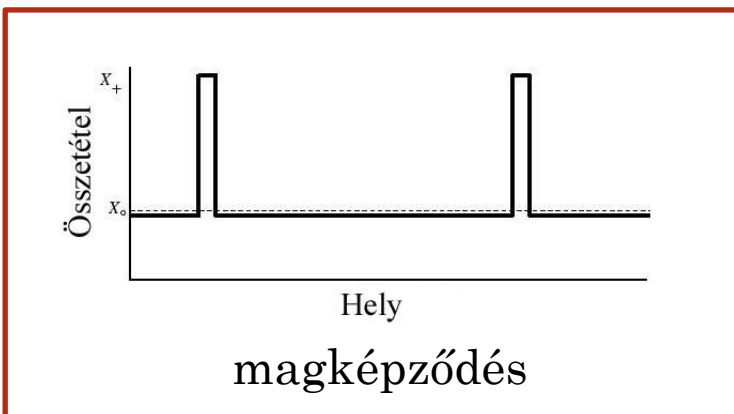


FÁZISSZÉTVÁLÁS, CU-AG RENDSZER

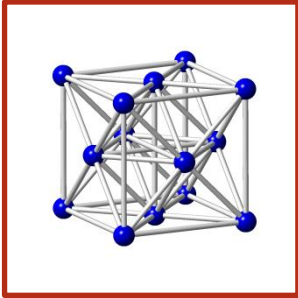
2012. február 28.



egyensúlyi Cu-Ag fázisdiagram

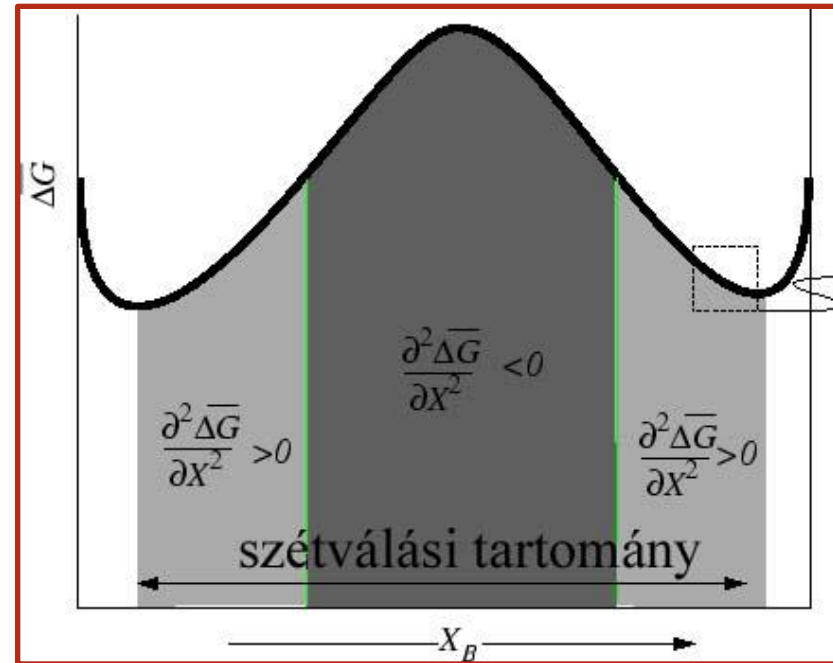


FÁZISSZÉTVÁLÁS, CU-AG RENDSZER

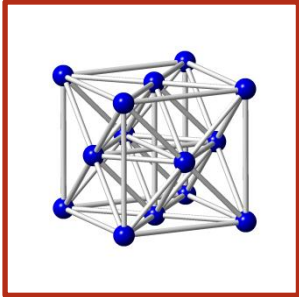


fcc elemi cella

$$a_{\text{Cu}} = 3,615 \text{ \AA}$$
$$a_{\text{Ag}} = 4,080 \text{ \AA}$$



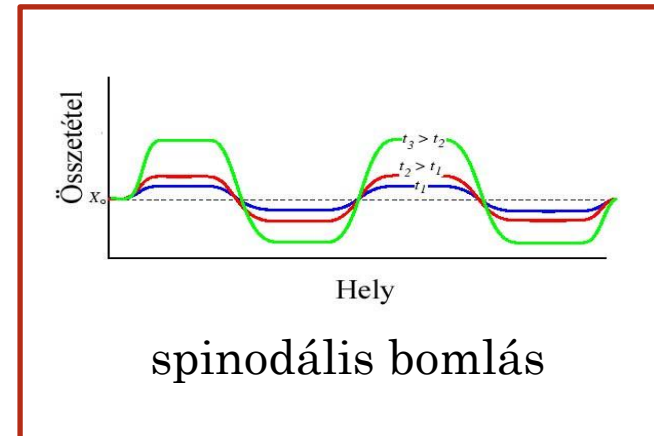
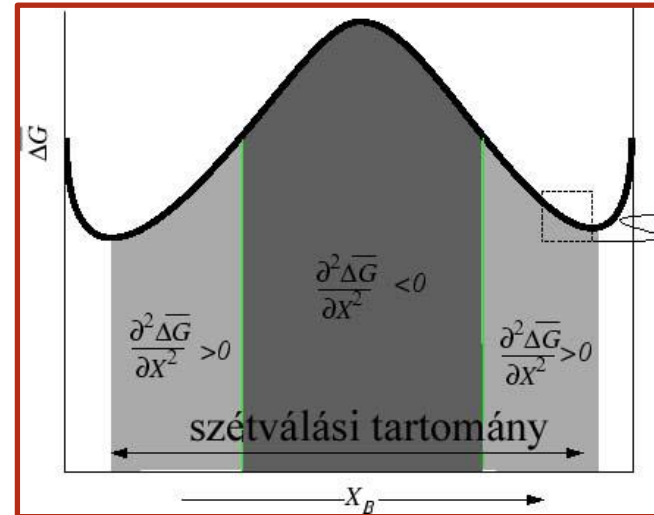
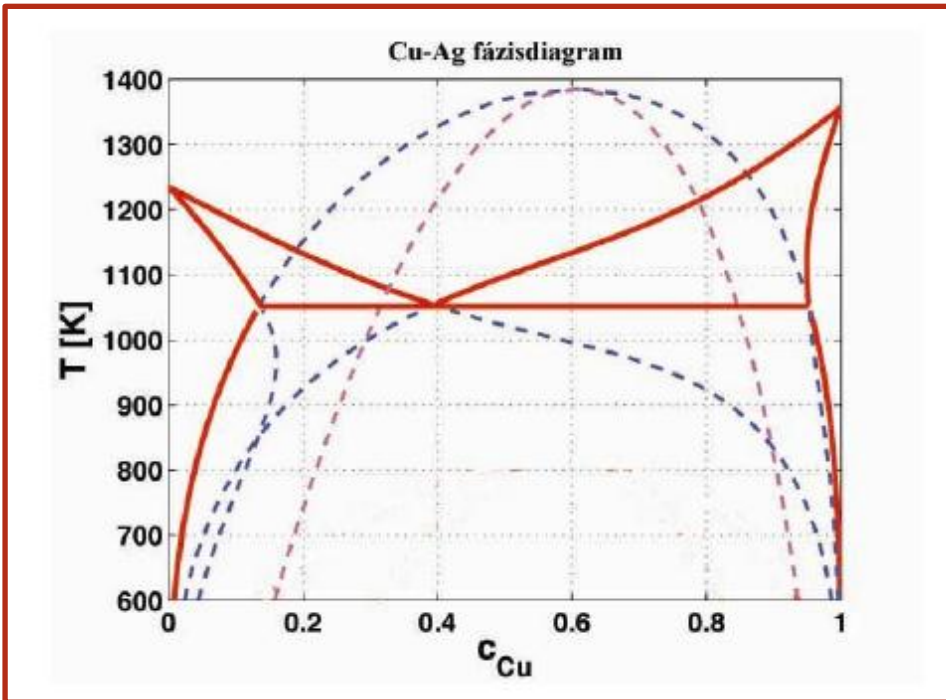
FÁZISSZÉTVÁLÁS, CU-AG RENDSZER



fcc elemi cella

$$a_{\text{Cu}} = 3,615 \text{ \AA}$$

$$a_{\text{Ag}} = 4,080 \text{ \AA}$$

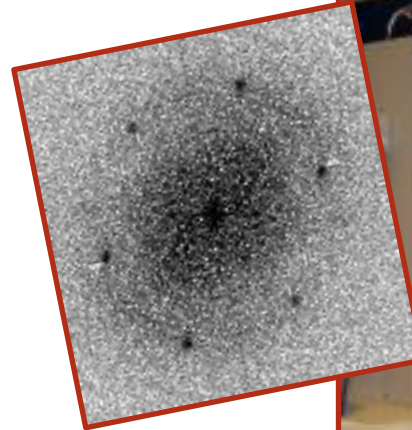
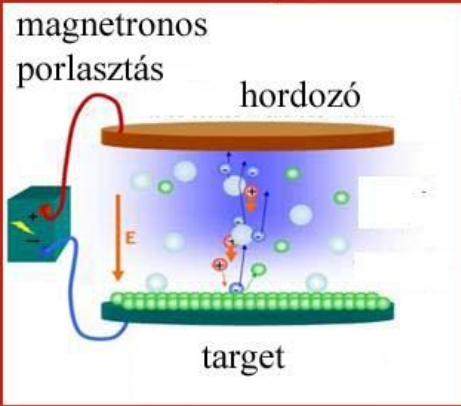


ELŐÁLLÍTÁS ÉS VIZSGÁLATI MÓDSZEREK

2012. február 28.

Magnetronos porlasztás

Transzmissziós
elektronmikroszkópia

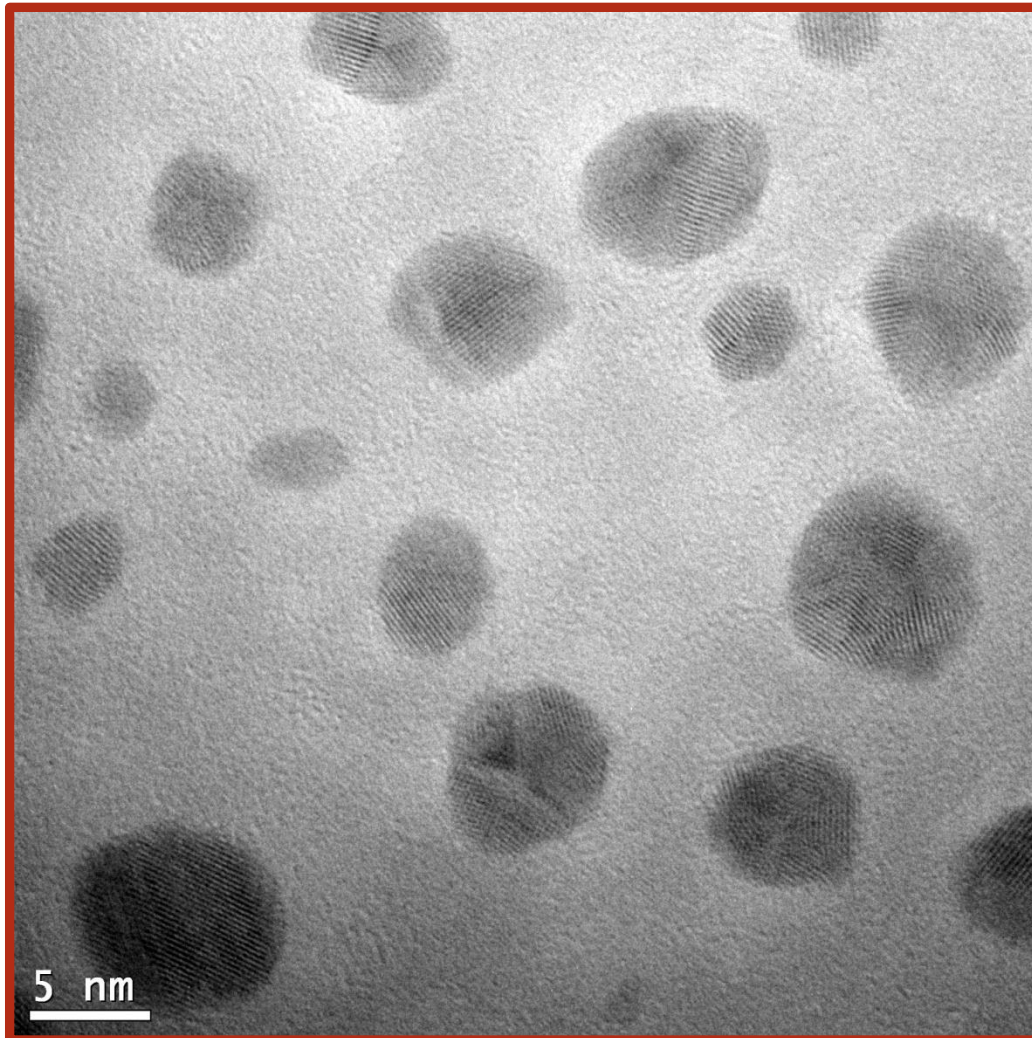


JEOL 3010, 300kV, 0,17nm pontfelb.



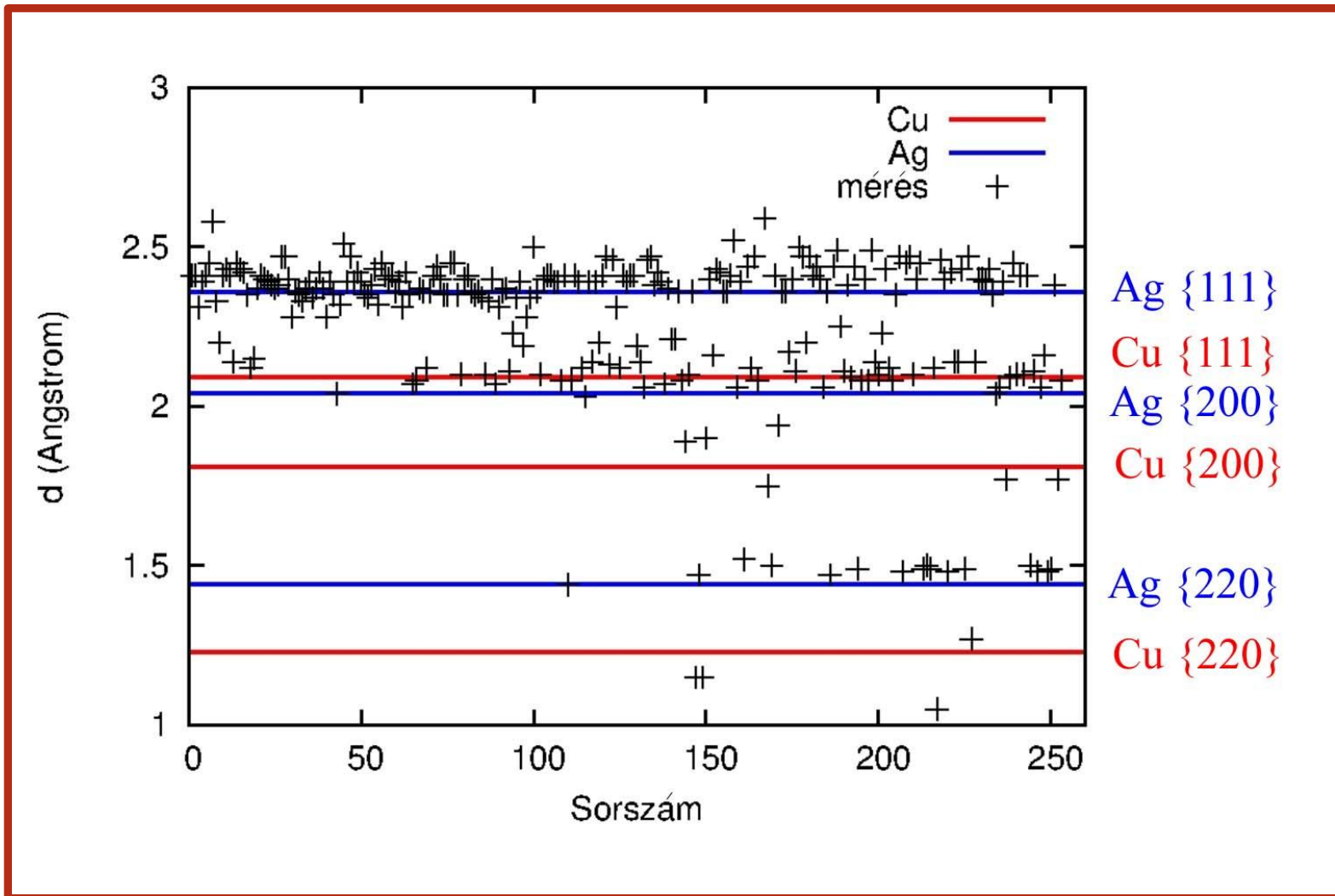
ÁTTEKINTŐ KÉP

20 at% Cu 80 at% Ag

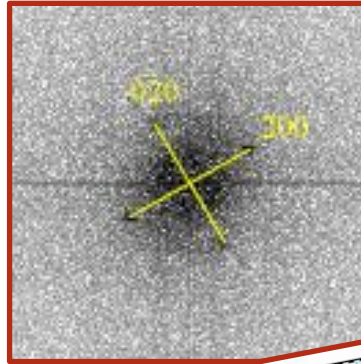
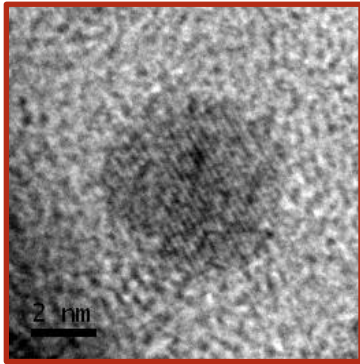


AZ 40 AT% CU-TARTALMÚ MINTÁBAN MÉRHETŐ RÁCSTÁVOLSÁGOK

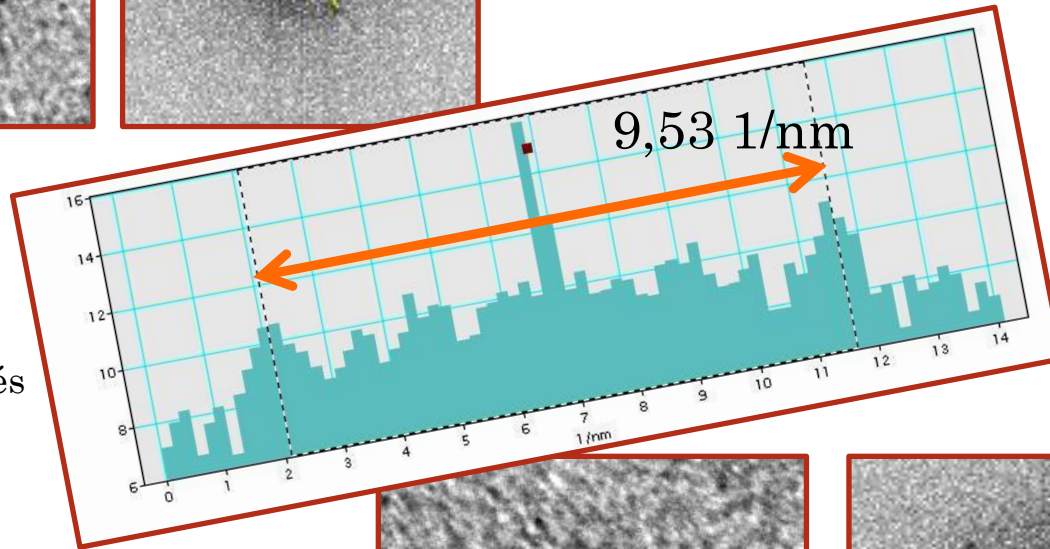
2012. február 28.



EGYFÁZISÚ SZEMCSÉK



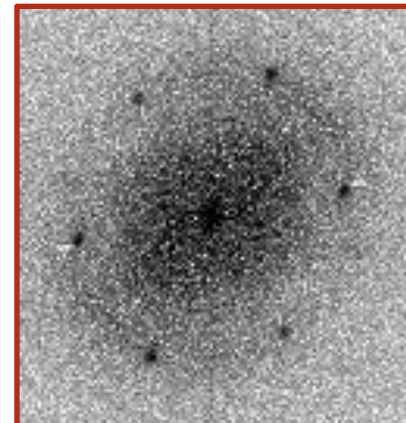
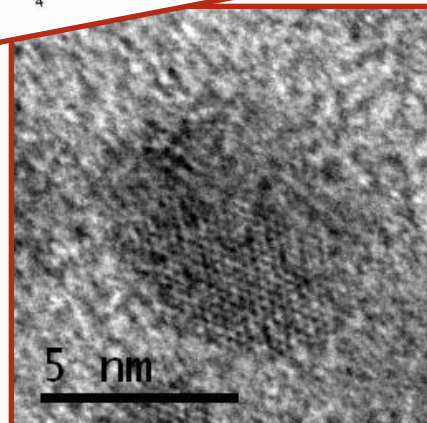
[001] irányból nézünk a szemcsére



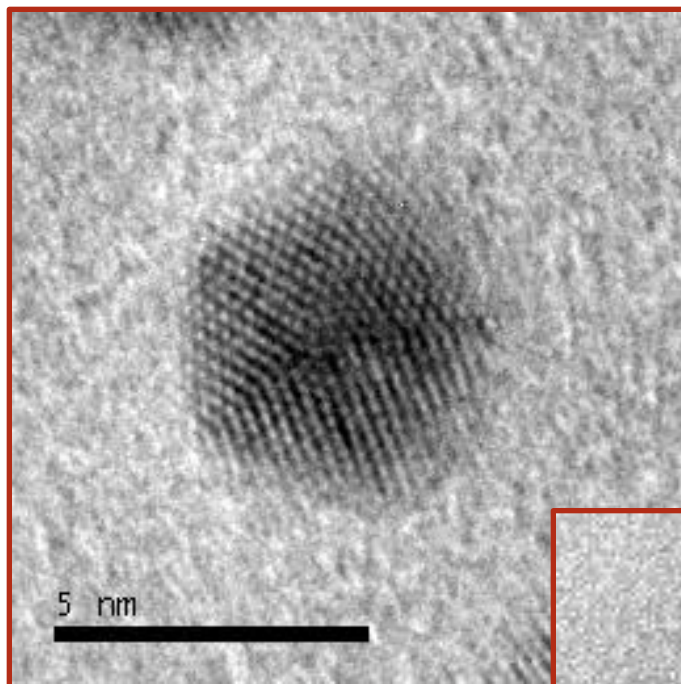
2,10Å

a rácsávolságmérés módszere

(110) síkkal felfekvő szemcse



CIKLIKUS IKER

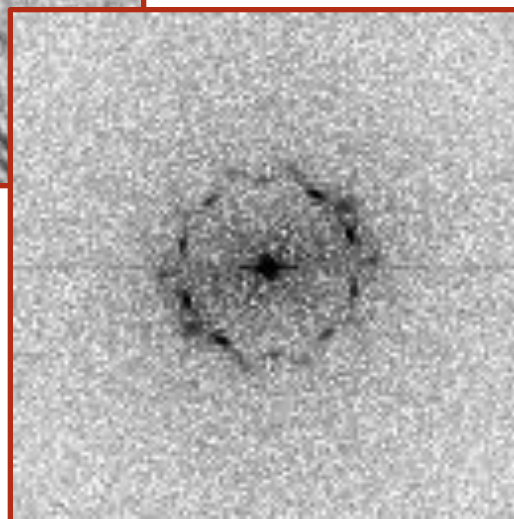


ötfogású szimmetria

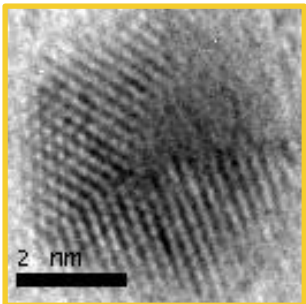
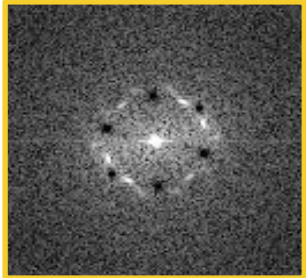
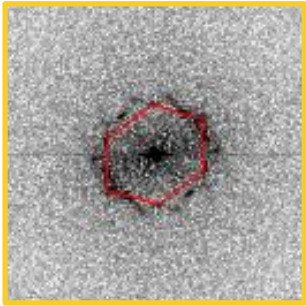
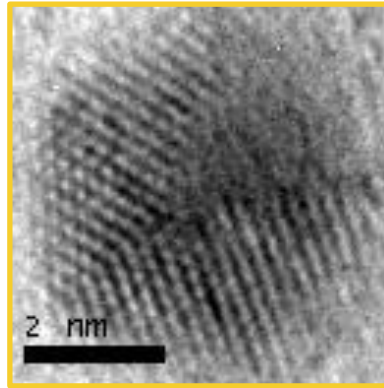
{111} és {200} típusú
reflexiók

{111} ikersíkok

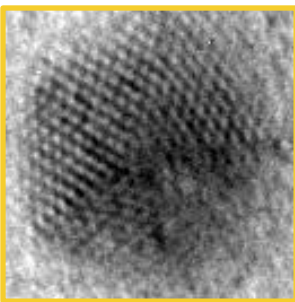
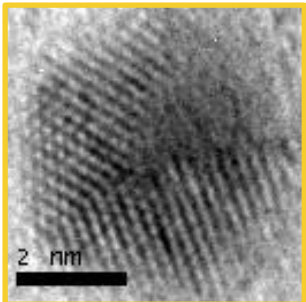
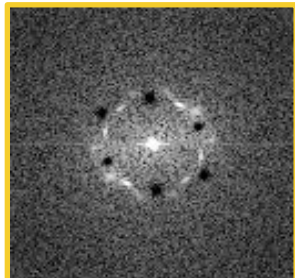
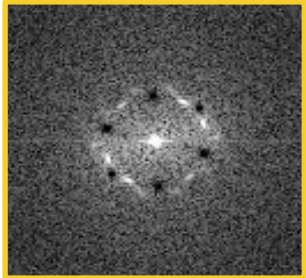
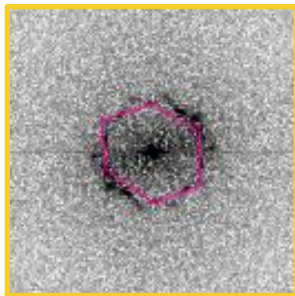
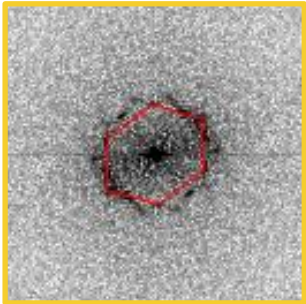
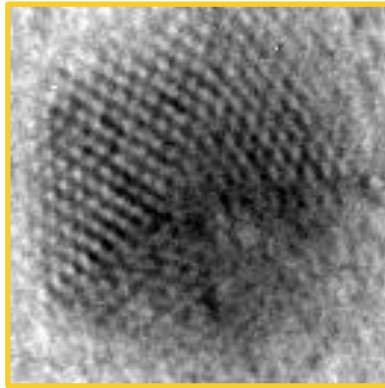
szilárd oldat az 5
„cikkelyben”



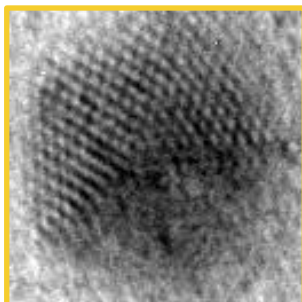
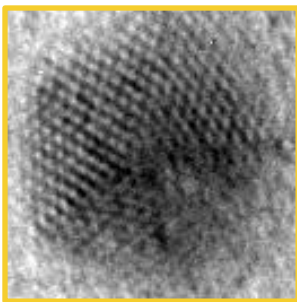
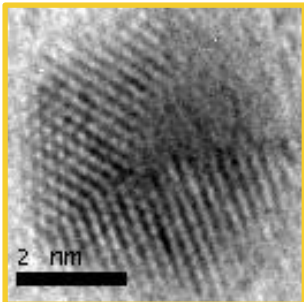
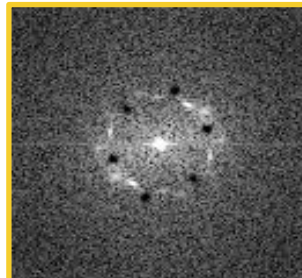
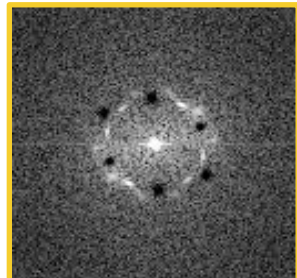
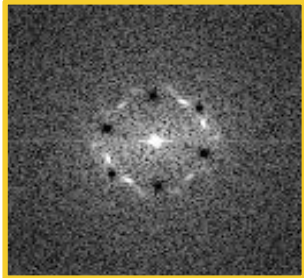
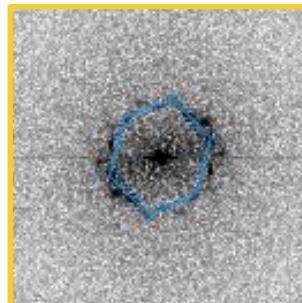
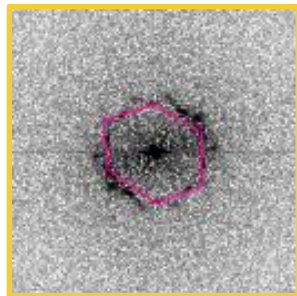
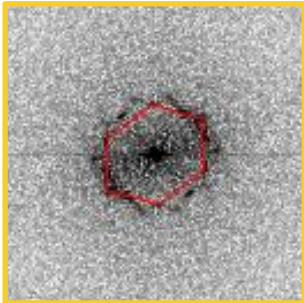
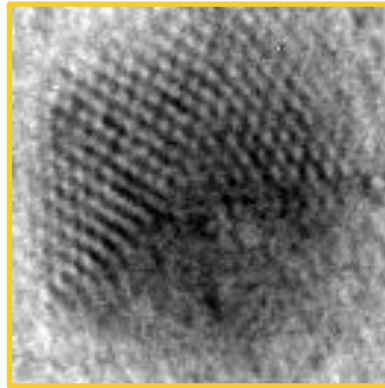
CIKLIKUS IKER



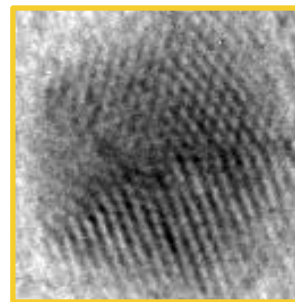
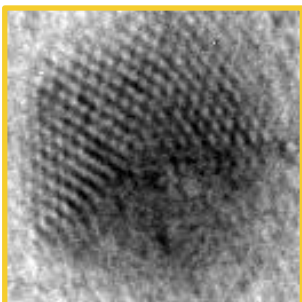
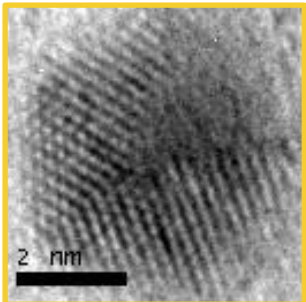
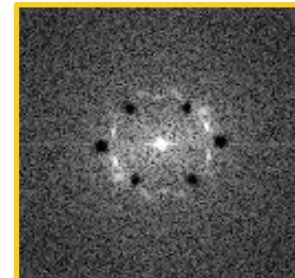
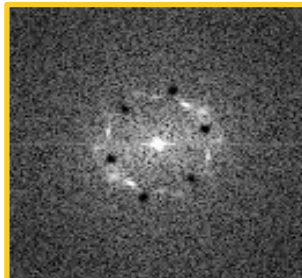
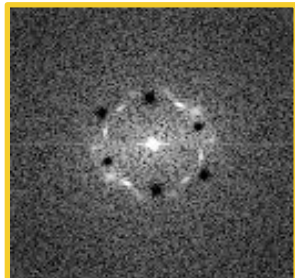
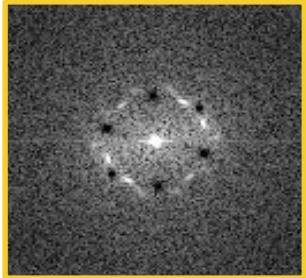
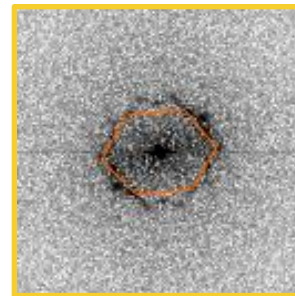
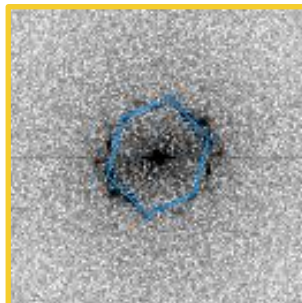
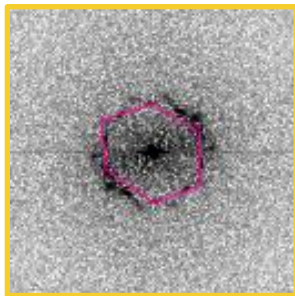
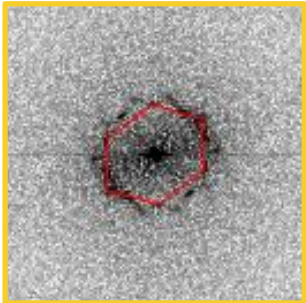
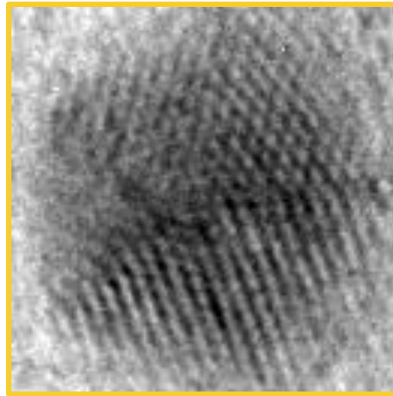
CÍKLIKUS IKER



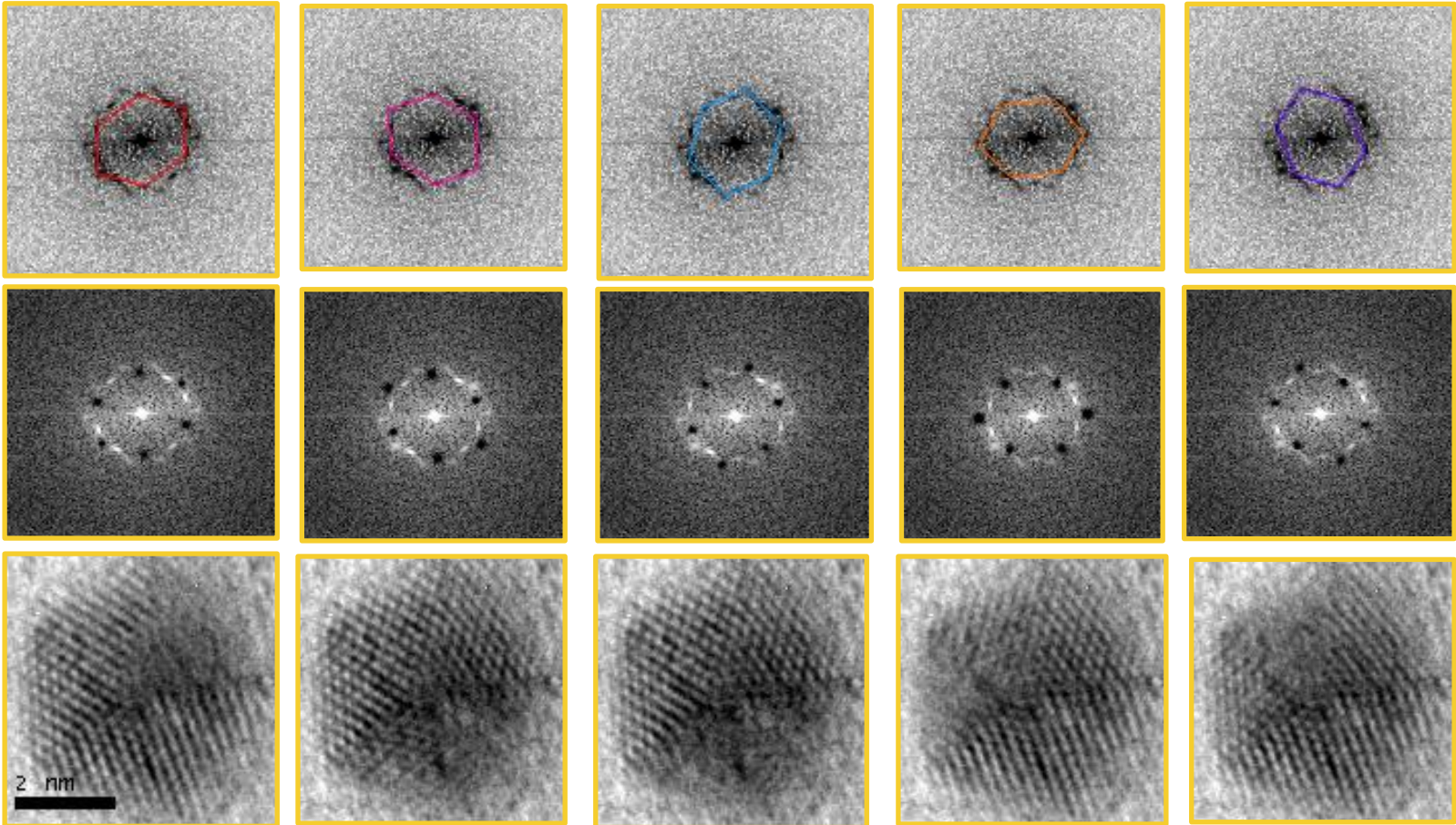
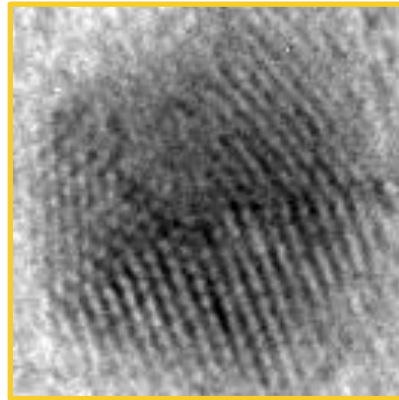
CÍKLIKUS IKER



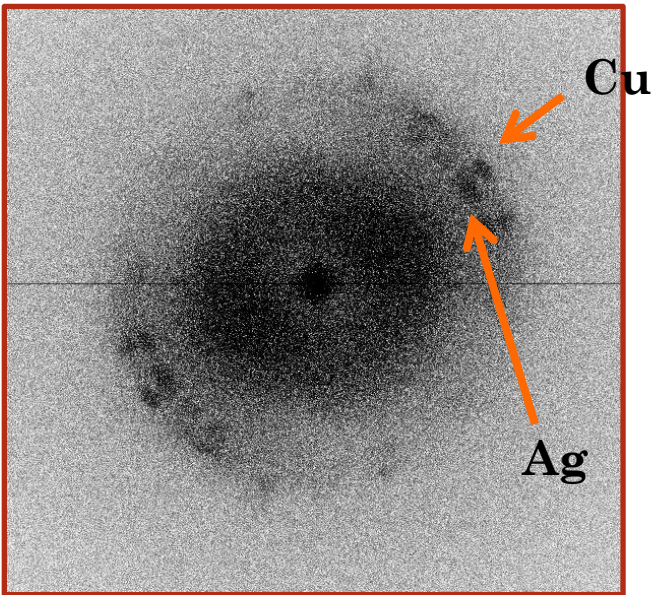
CÍKLIKUS IKER



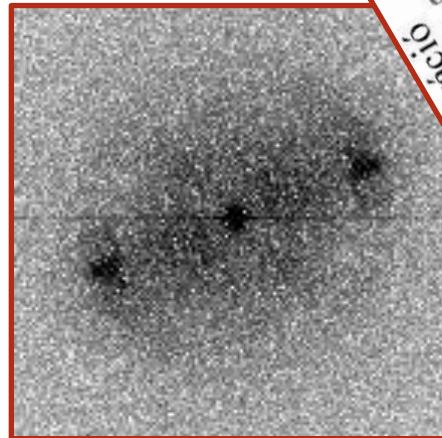
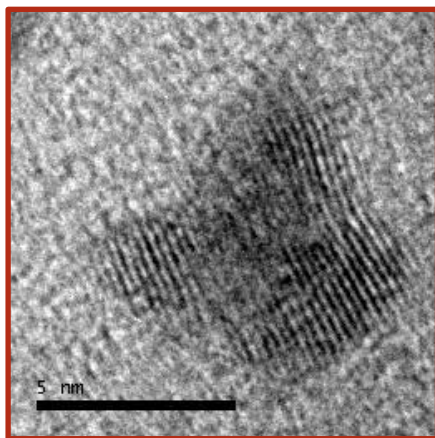
CÍKLIKUS IKER



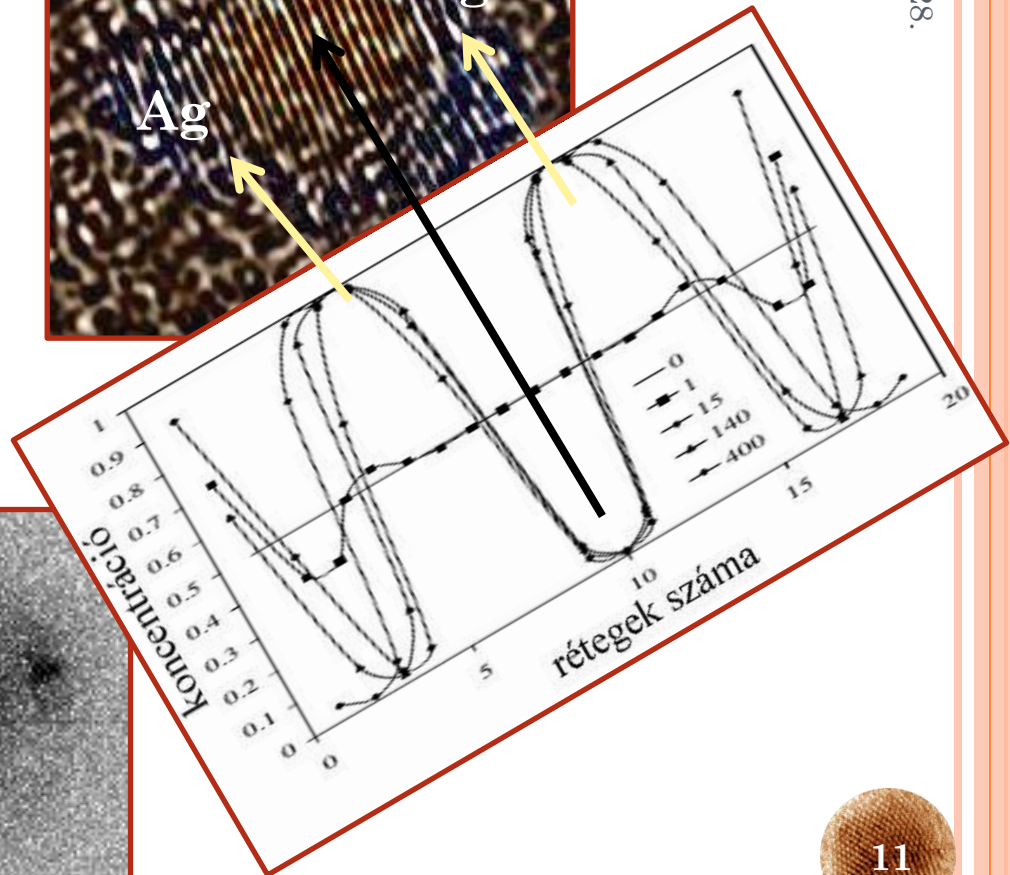
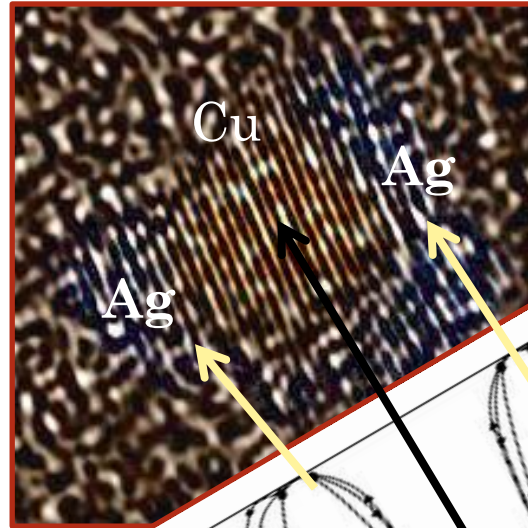
SPINODÁLIS BOMLÁS



epitaxiális szétválás



70 at% Cu 30 at% Ag

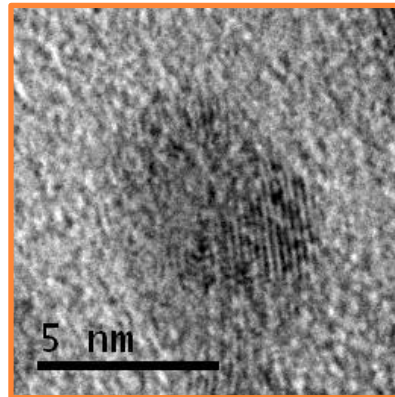
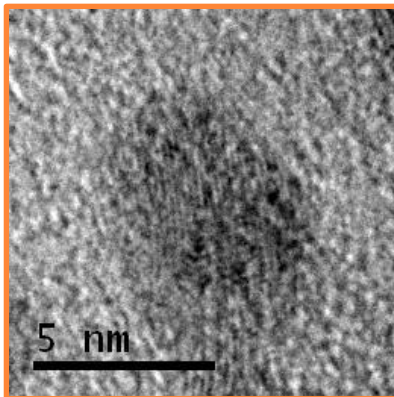
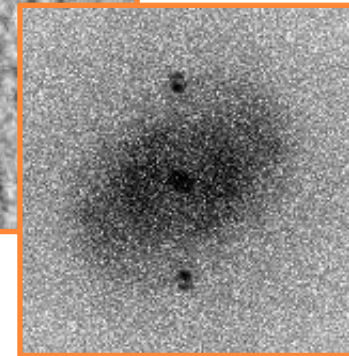
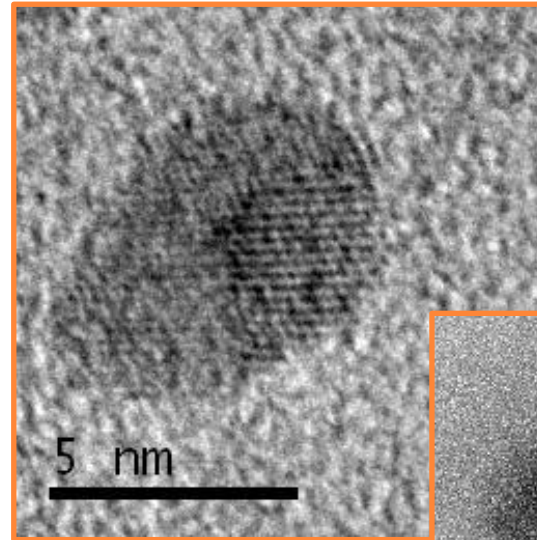
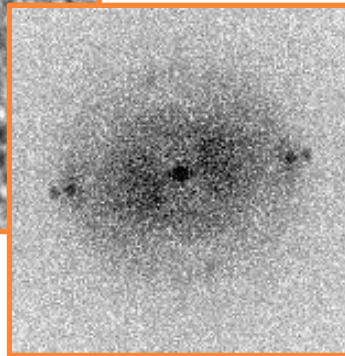
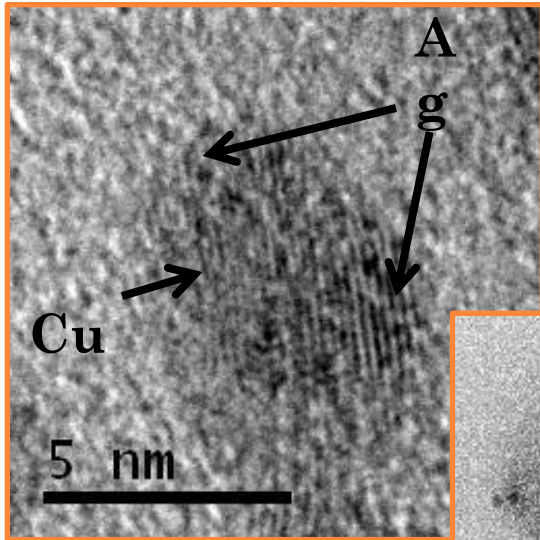


szimulált spinodális bomlás (Beke et al., 2003)



SPINODÁLIS BOMLÁS – TOVÁBBI PÉLDÁK

2012. február 28.



folytonosan átmenő rácsparaméterek

epitaxiális szétválás

változás hullámhossza megfigyelhető



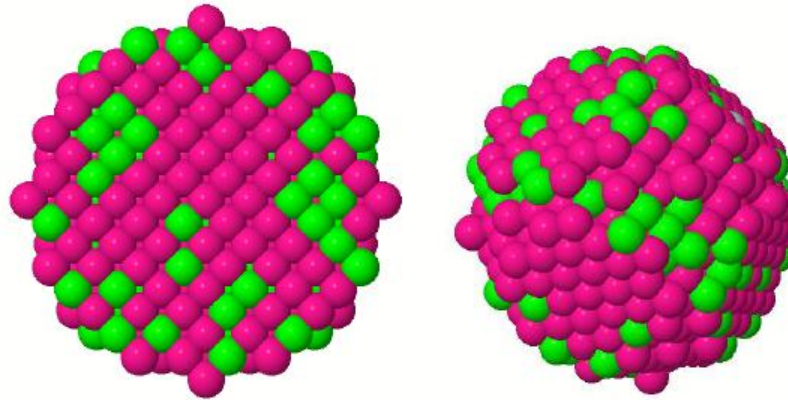
ÖSSZEFOGLALÁS

- Cu-Ag övözet nanoszemcsék fázisszétválási folyamatainak vizsgálata többféle összetétel mellett
- eszközök: magnetronos porlasztás, HREM
- megfigyelhetők (2-20 nm):
 - egykristályok, homogén szilárd oldat, polikristályos szemcsék
 - ikrek (ikerhatár átfordulása, ciklikus iker)
 - kétfázisú szemcsék
- spinodális bomlás – spinodálgörbe eltolódása
- jövő: önszerveződő komplex struktúrák kialakítása?

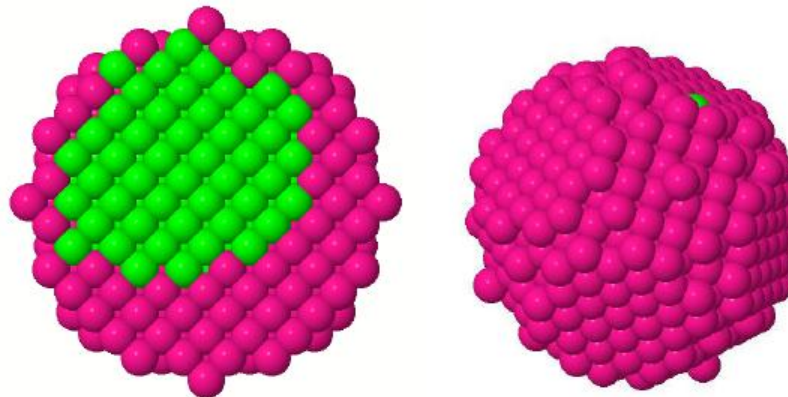


MONTE CARLO-SZIMULÁCIÓ

70% Ag, 8 atomtávolság sugár



Kiindulási állapot.



Hőkezelés után.

KÖSZÖNÖM A FIGYELMET!