Characteristic investigation of sputtered Co-Cu films on glass substrate

Presented by Suthasinee Somboonsap

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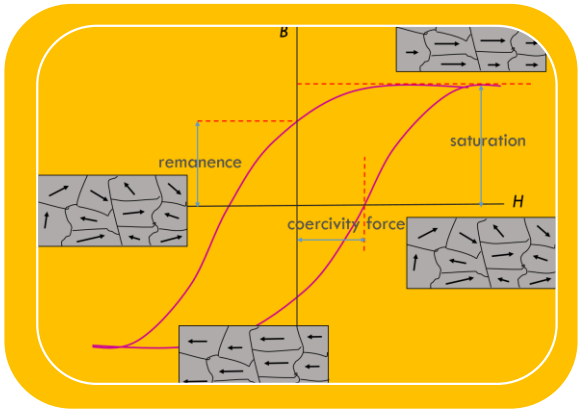
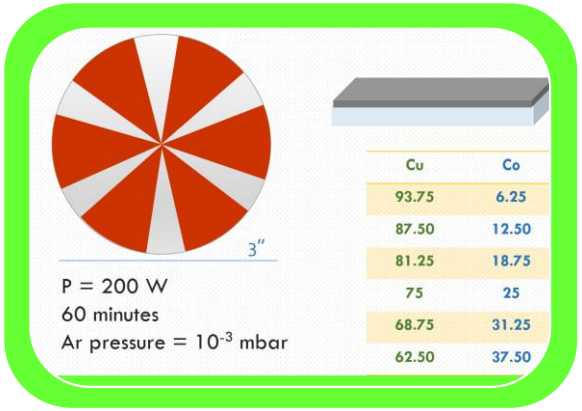
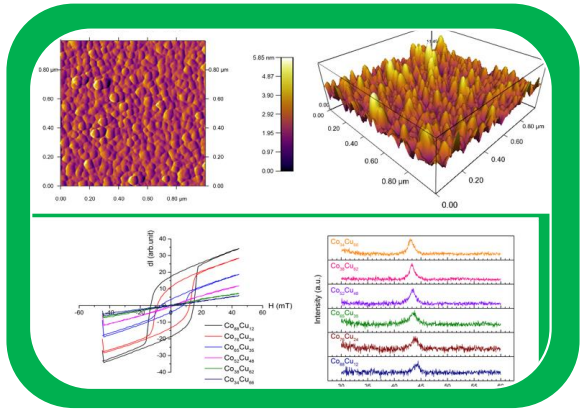
Outline



Introduction



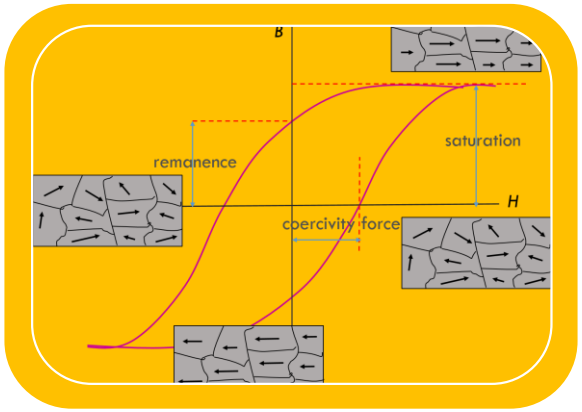
Experiment



Results & Discussion

Conclusions

Outline



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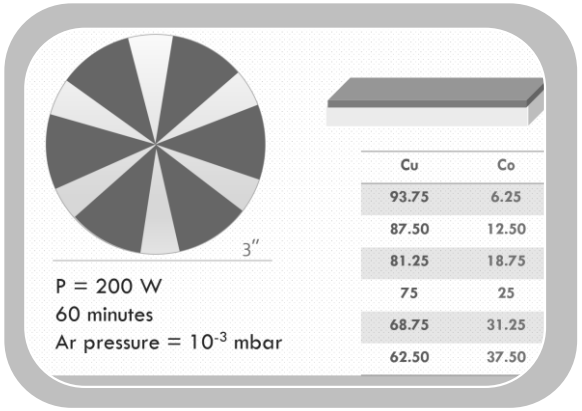
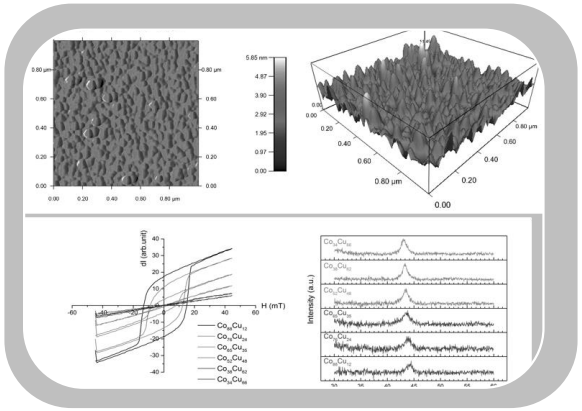
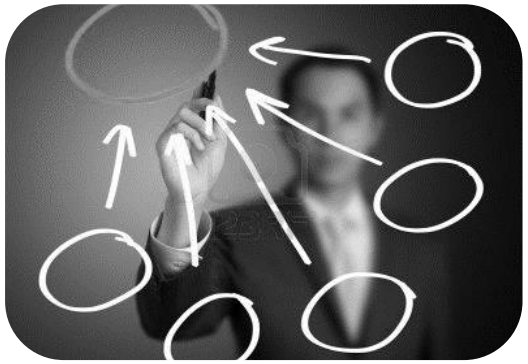


Cu	Co
93.75	6.25
87.50	12.50
81.25	18.75
75	25
68.75	31.25
62.50	37.50

Experiment



Results & Discussion



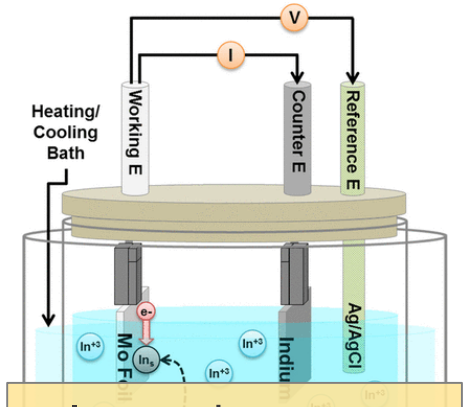
Conclusions

Introduction

Magnetic films

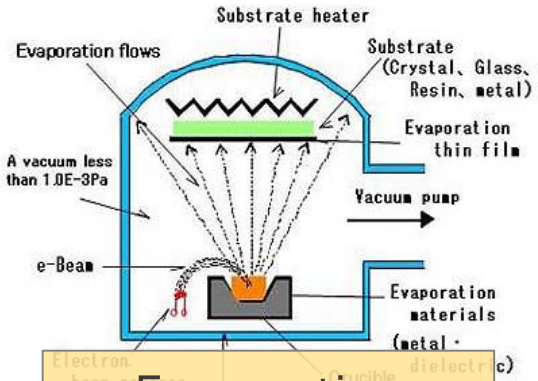
Co-Cu film

Fabrication



Electrodeposition

Peter Lobaccaro et al. (2004)

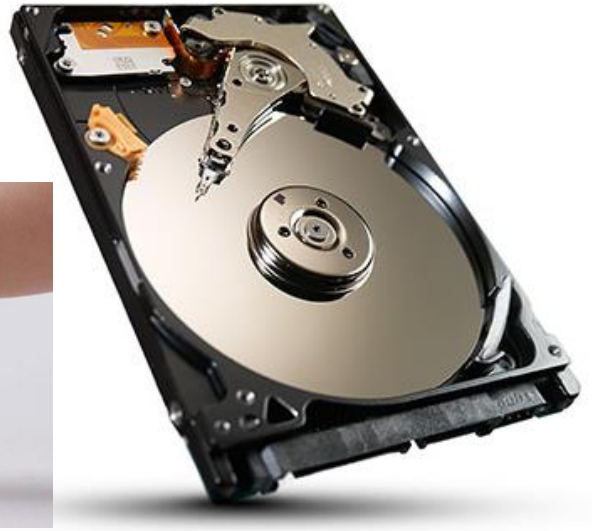


Evaporation

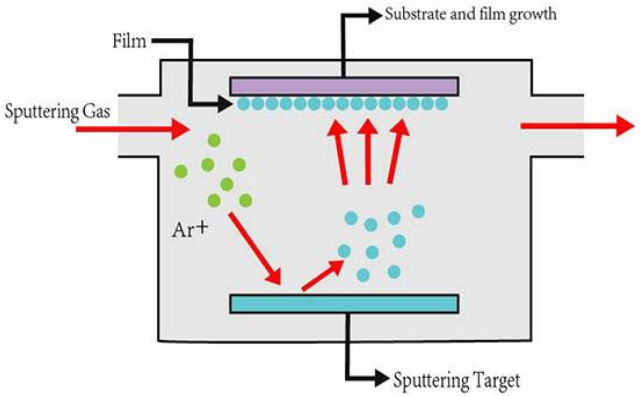
http://ns.kopt.co.jp/English/ca_jou-gi/joutyaku.html

Applications

http://www.techfresh.net/fujitsu-palmsecure-sl-the-worlds-smallest-contactless-palm-vein-authentication-sensor/



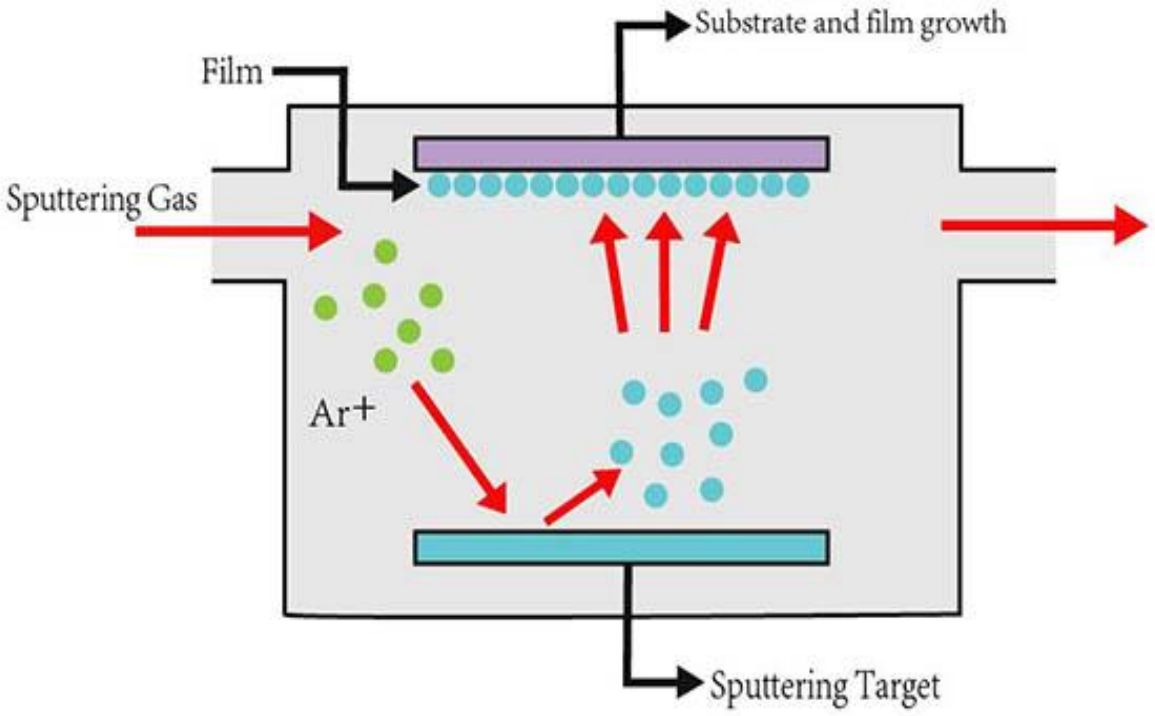
http://arstechnica.com/gadgets/2013/03/seagate-is-done-making-7200rpm-2-5-pure-hard-disk-drives/



http://www.samaterials.com/content/115-what-is-sp

Sputtering

Sputtering process



http://www.samaterials.com/content/115-what-is-sputtering

Fig 1. Sputtering process

- Materials with high melting point.
- Smooth surface.
- Good adhesion between film and substrate.
- Film composition according to source target.

Introduction

Hysteresis loop

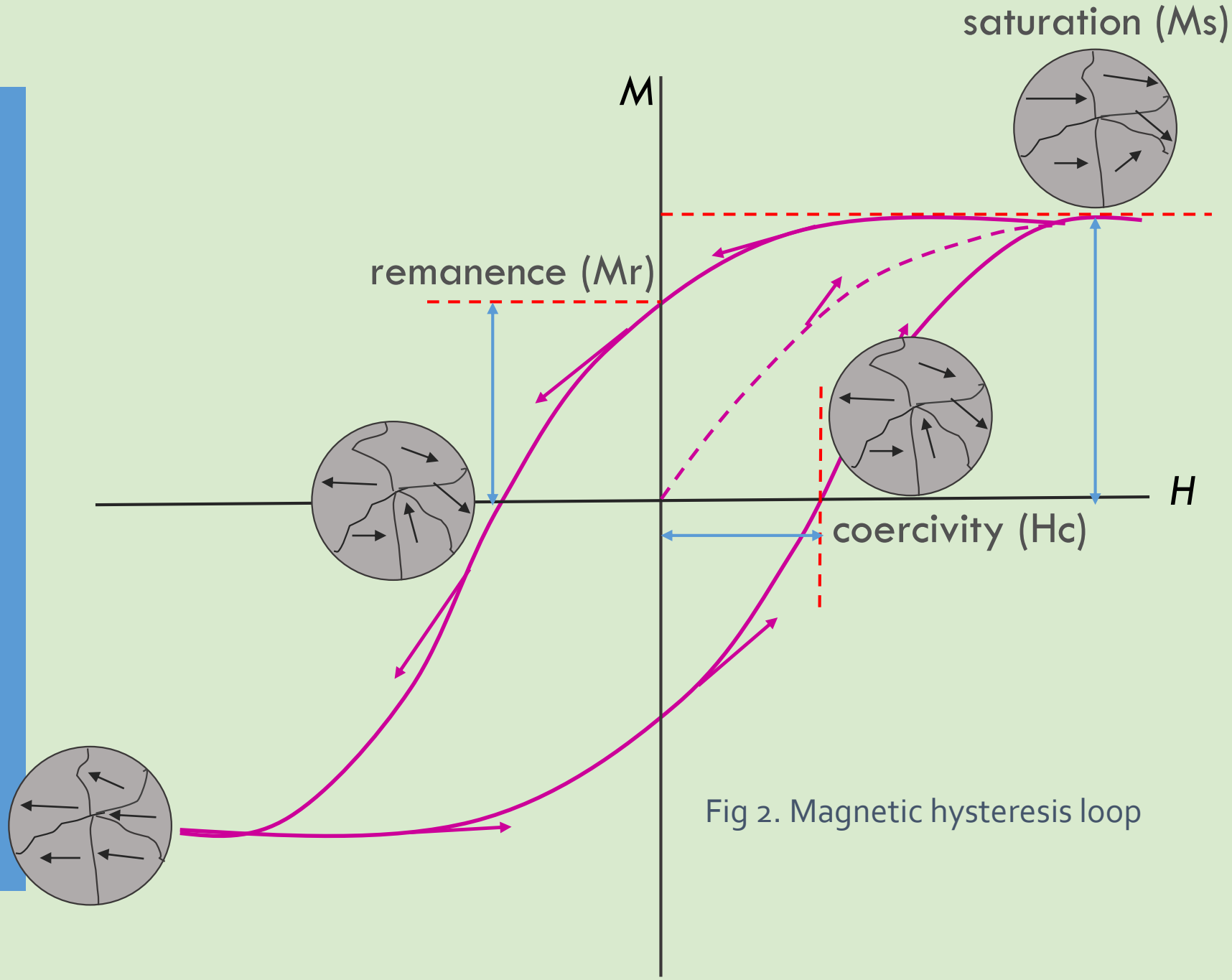
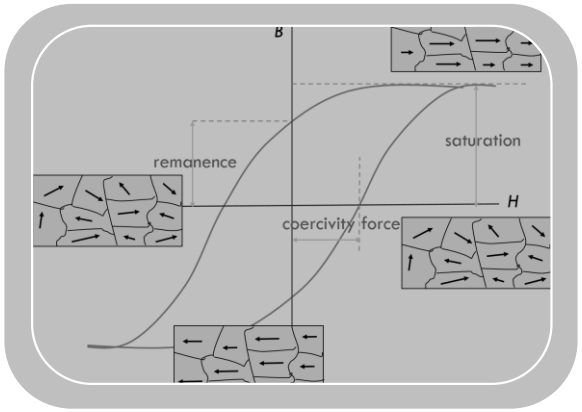
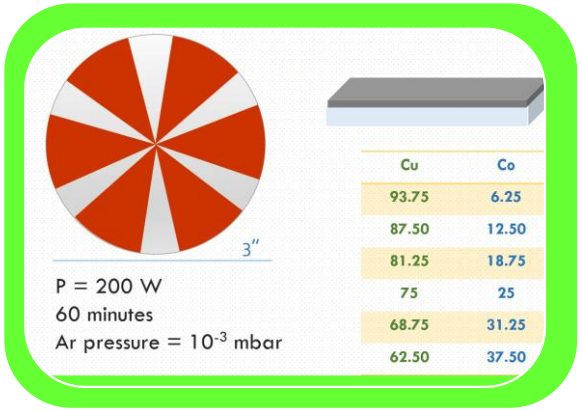


Fig 2. Magnetic hysteresis loop

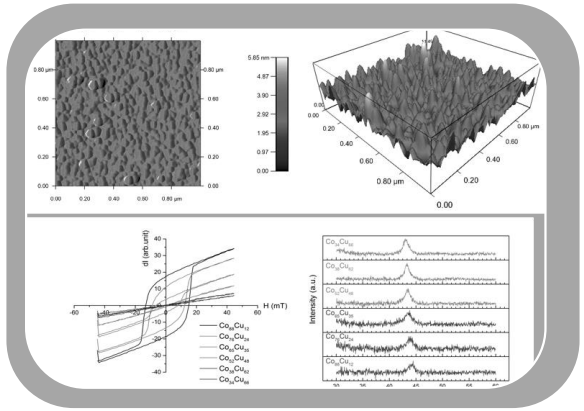
Outline



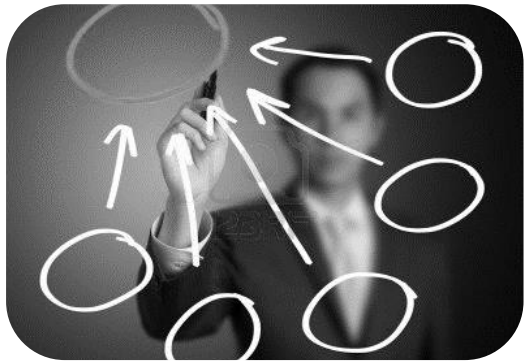
Introduction



Experiment

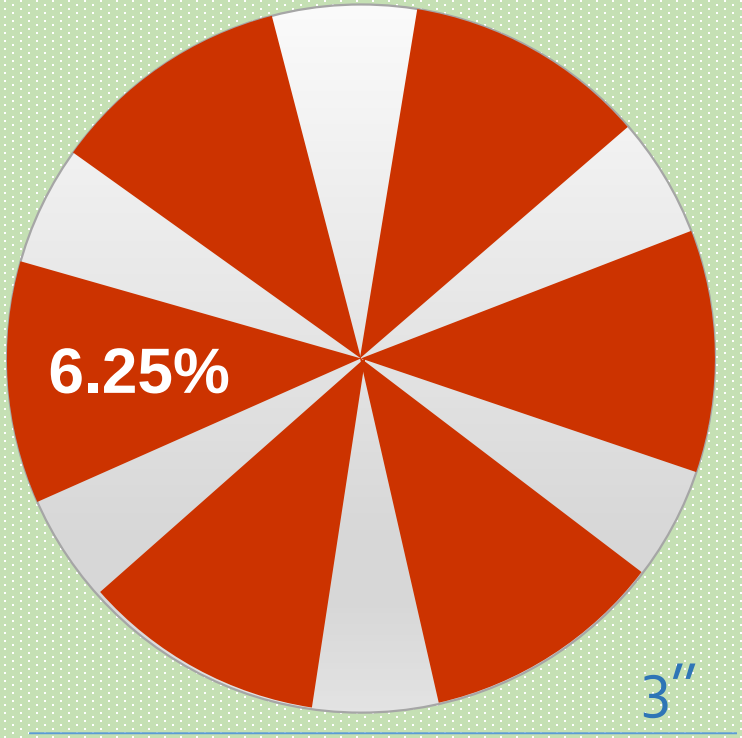


Results & Discussion



Conclusions

Experiment



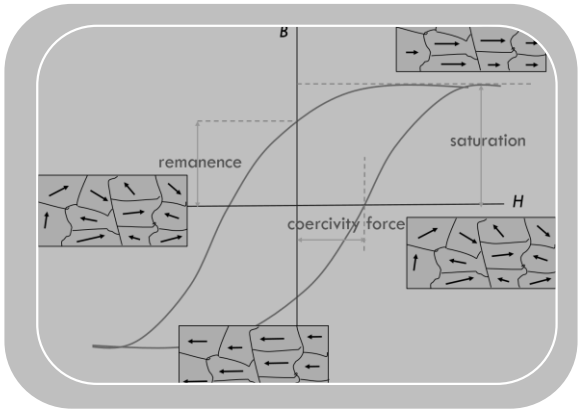
P = 200 W

60 minutes

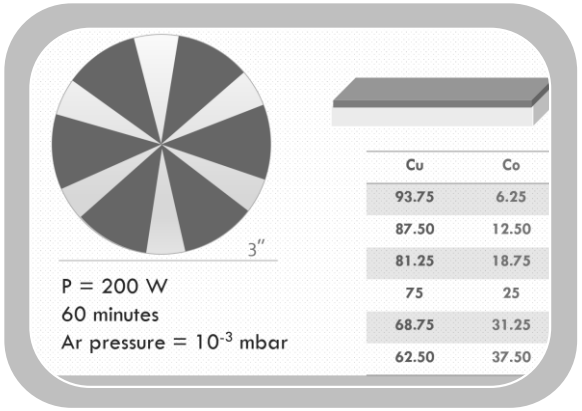
Ar pressure = 10^{-3} mbar

Co (area%)	Cu (area%)
93.75	6.25
87.50	12.50
81.25	18.75
75	25
68.75	31.25
62.50	37.50

Outline



Introduction



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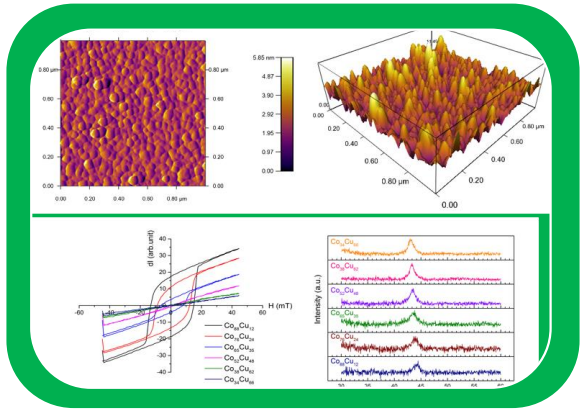
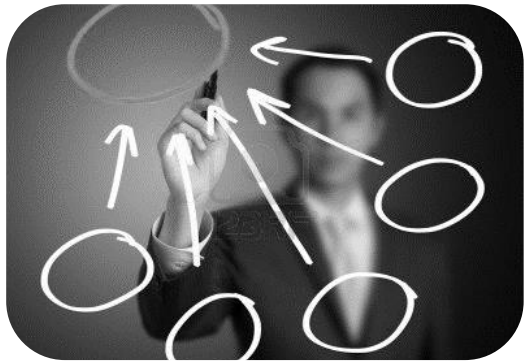


Results & Discussion



Conclusions

Results & Discussion

Chemical composition

Table 1. Chemical composition of Co_xCu_{100-x} films with sputtering area.

Co:Cu (%Area)	Co (%Atomic)	Cu (%Atomic)	Co:Cu (%Atomic)
$Co_{93.75}Cu_{6.25}$	88	12	$Co_{88}Cu_{12}$
$Co_{87.5}Cu_{12.5}$	76	24	$Co_{76}Cu_{24}$
$Co_{81.25}Cu_{18.75}$	65	35	$Co_{65}Cu_{35}$
$Co_{75}Cu_{25}$	52	48	$Co_{52}Cu_{48}$
$Co_{68.75}Cu_{31.25}$	38	62	$Co_{38}Cu_{62}$
$Co_{62.5}Cu_{37.5}$	34	66	$Co_{34}Cu_{66}$

Results & Discussion

Structure

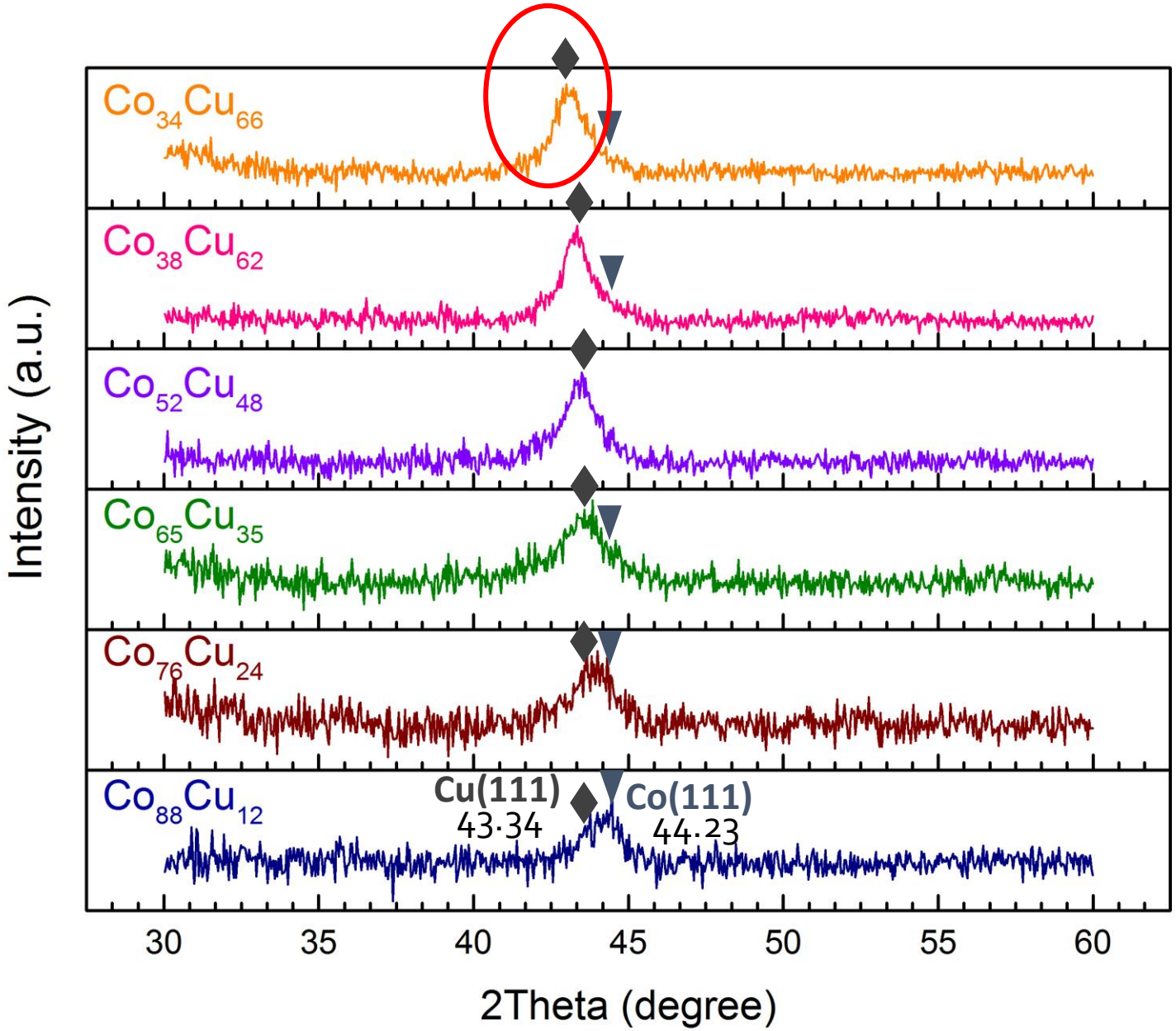
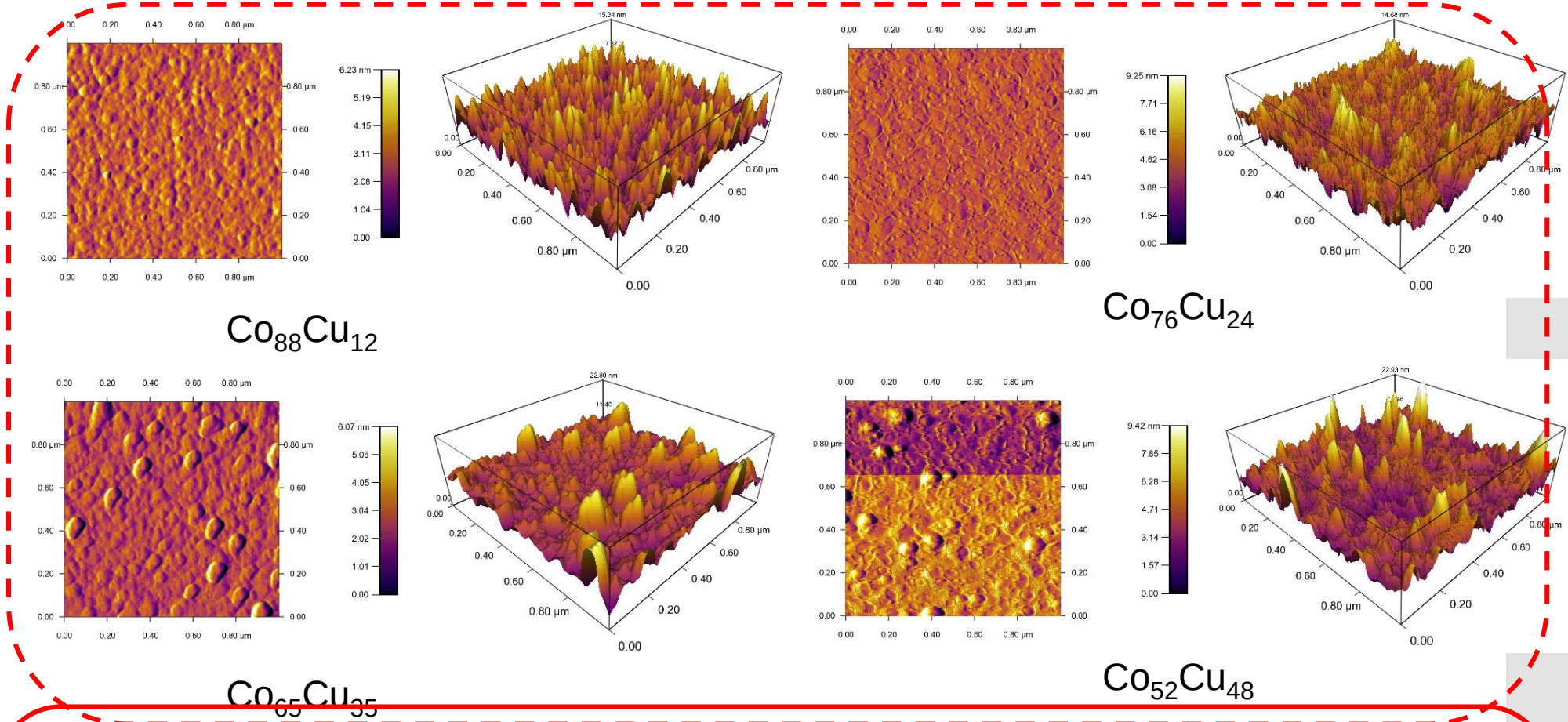


Fig 3. XRD patterns of Co_xCu_{100-x} films on glass substrate.

Results & Discussion

Morphology



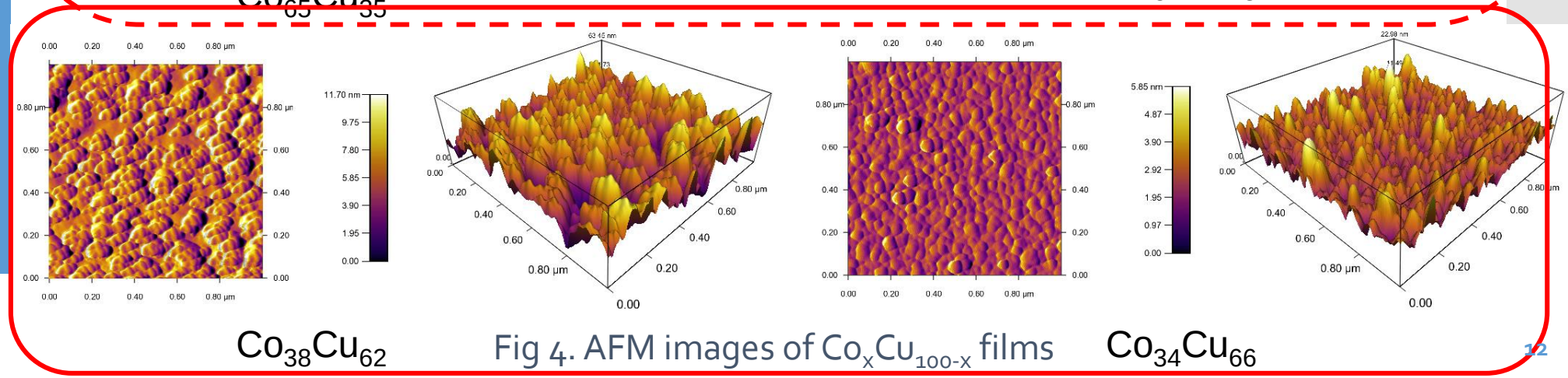


Fig 4. AFM images of Co_xCu_{100-x} films

Results & Discussion

Morphology

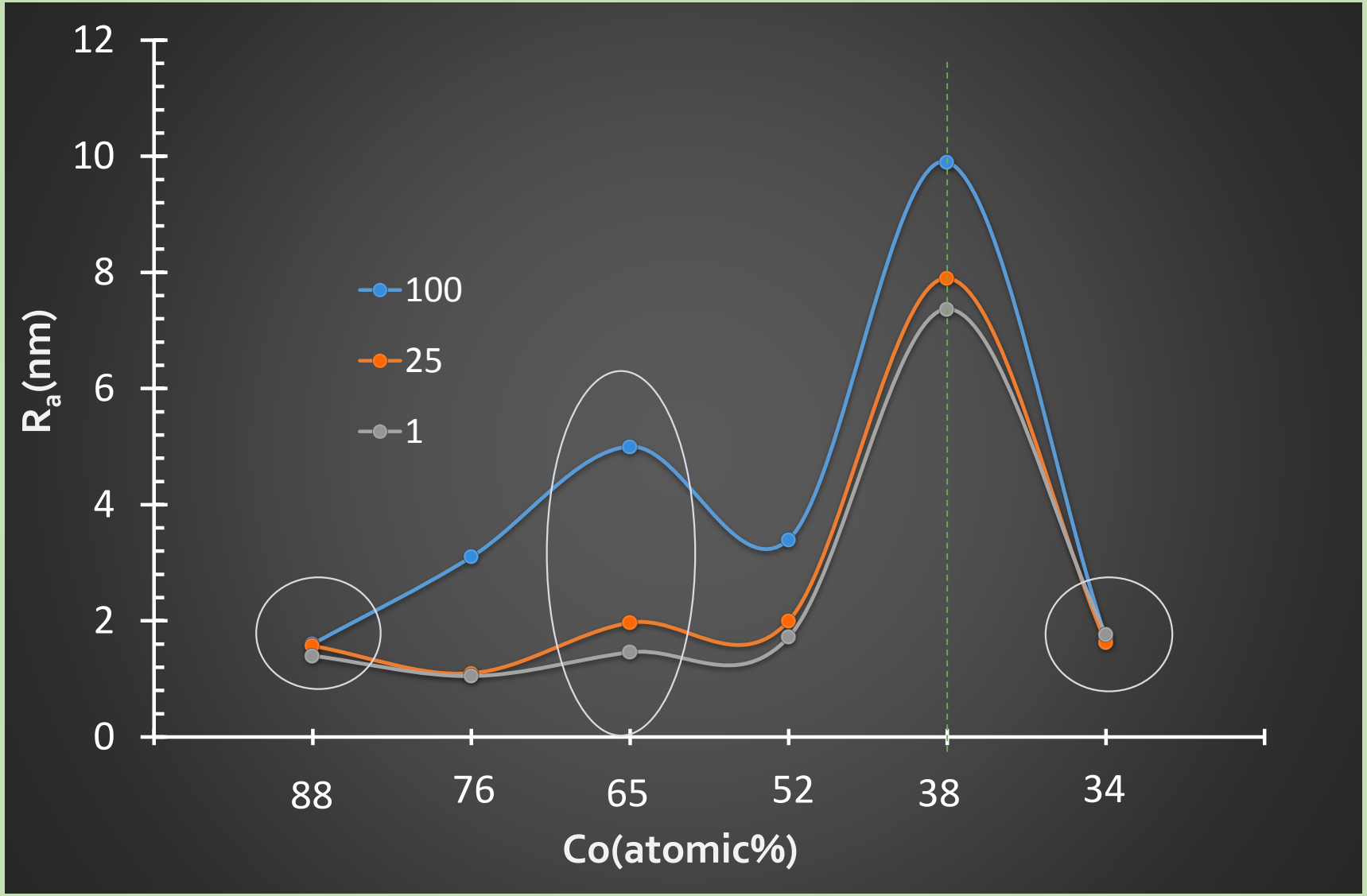


Fig 5. Roughness with Co composition by scanning over 100, 25 and 1 μm².

Electrical properties

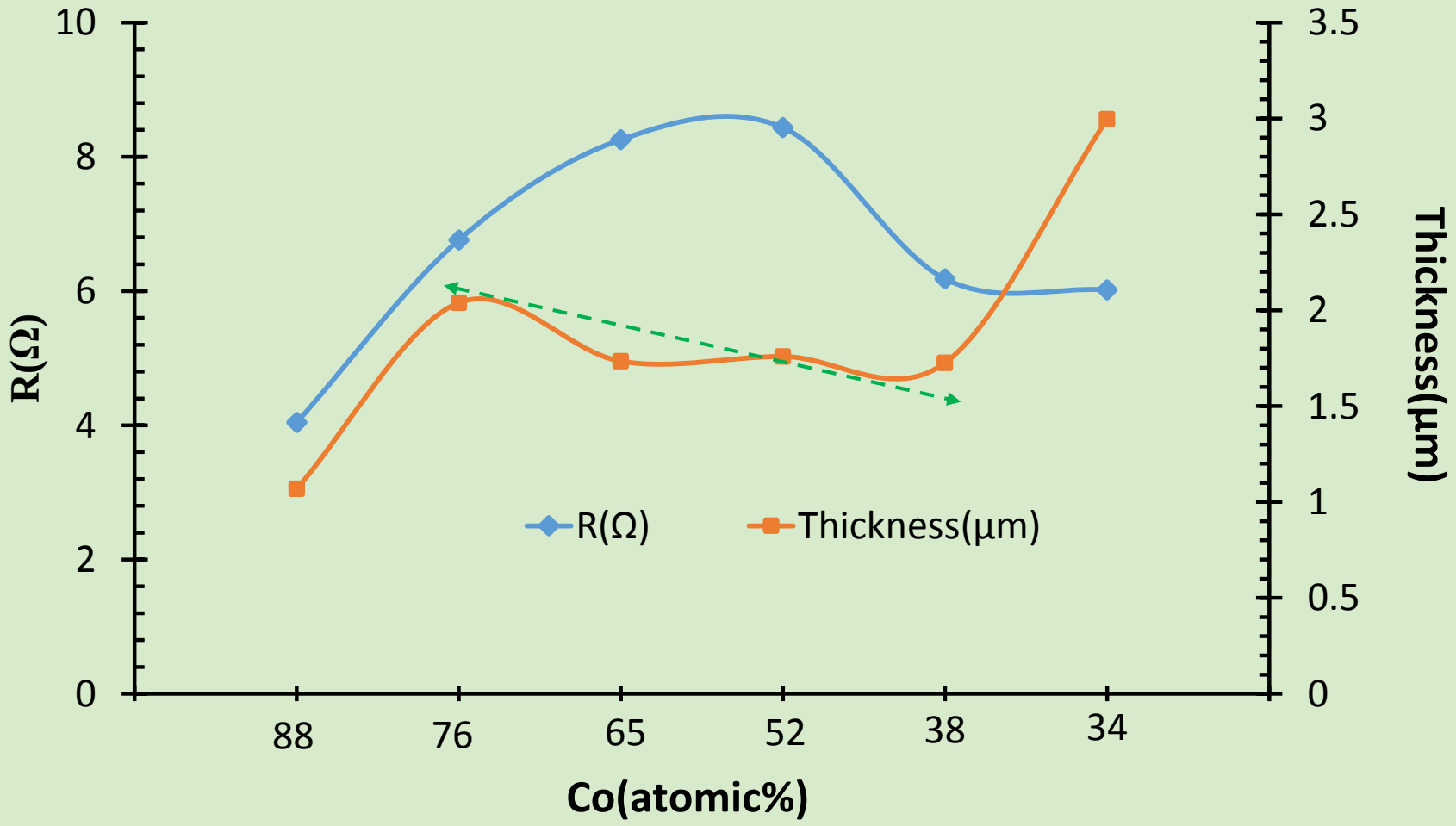


Fig 6. Resistance and thickness with Co composition.

Thermal properties

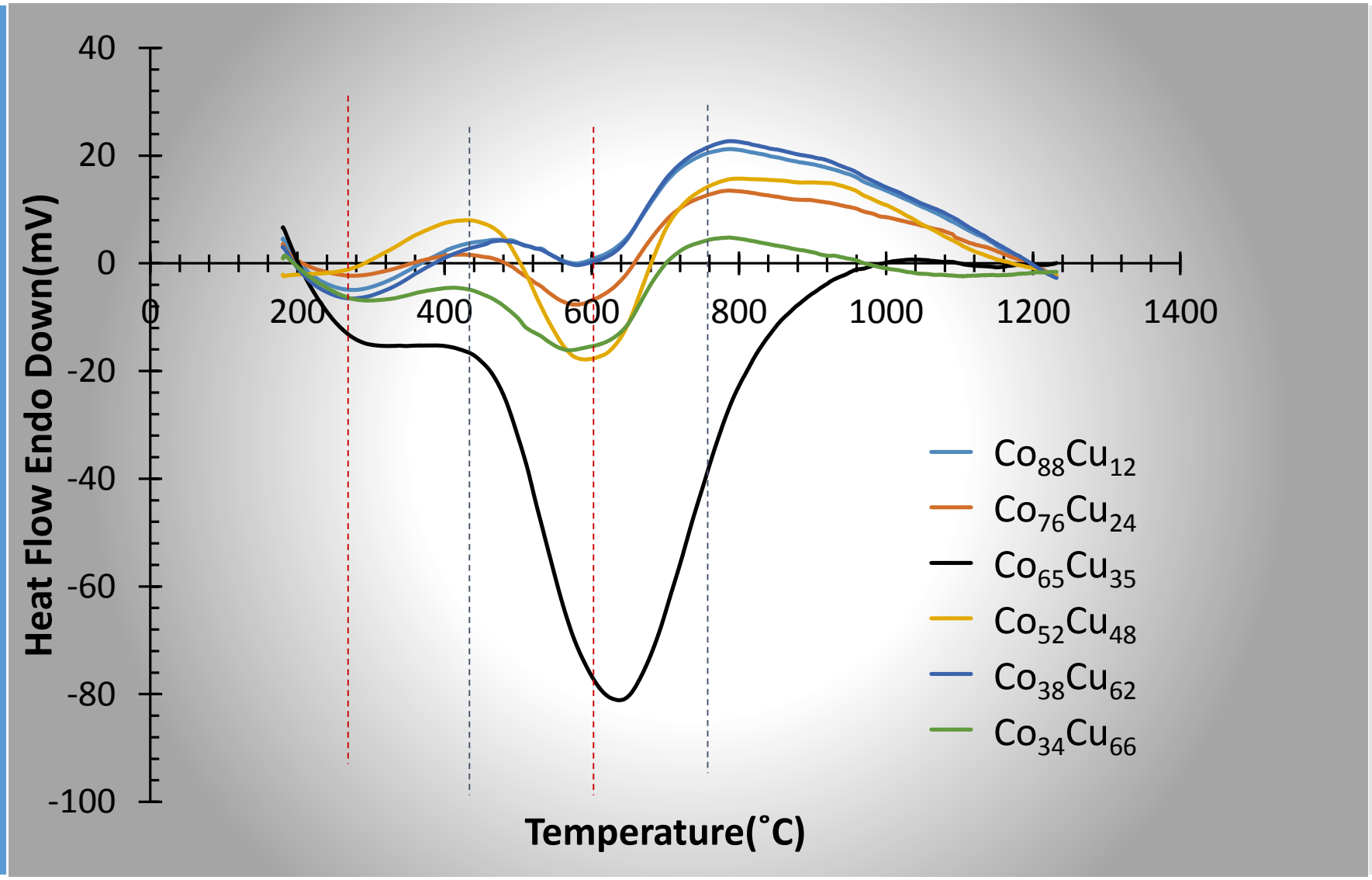


Fig 7. DTA curves of Co_xCu_{100-x} films

Magnetic properties

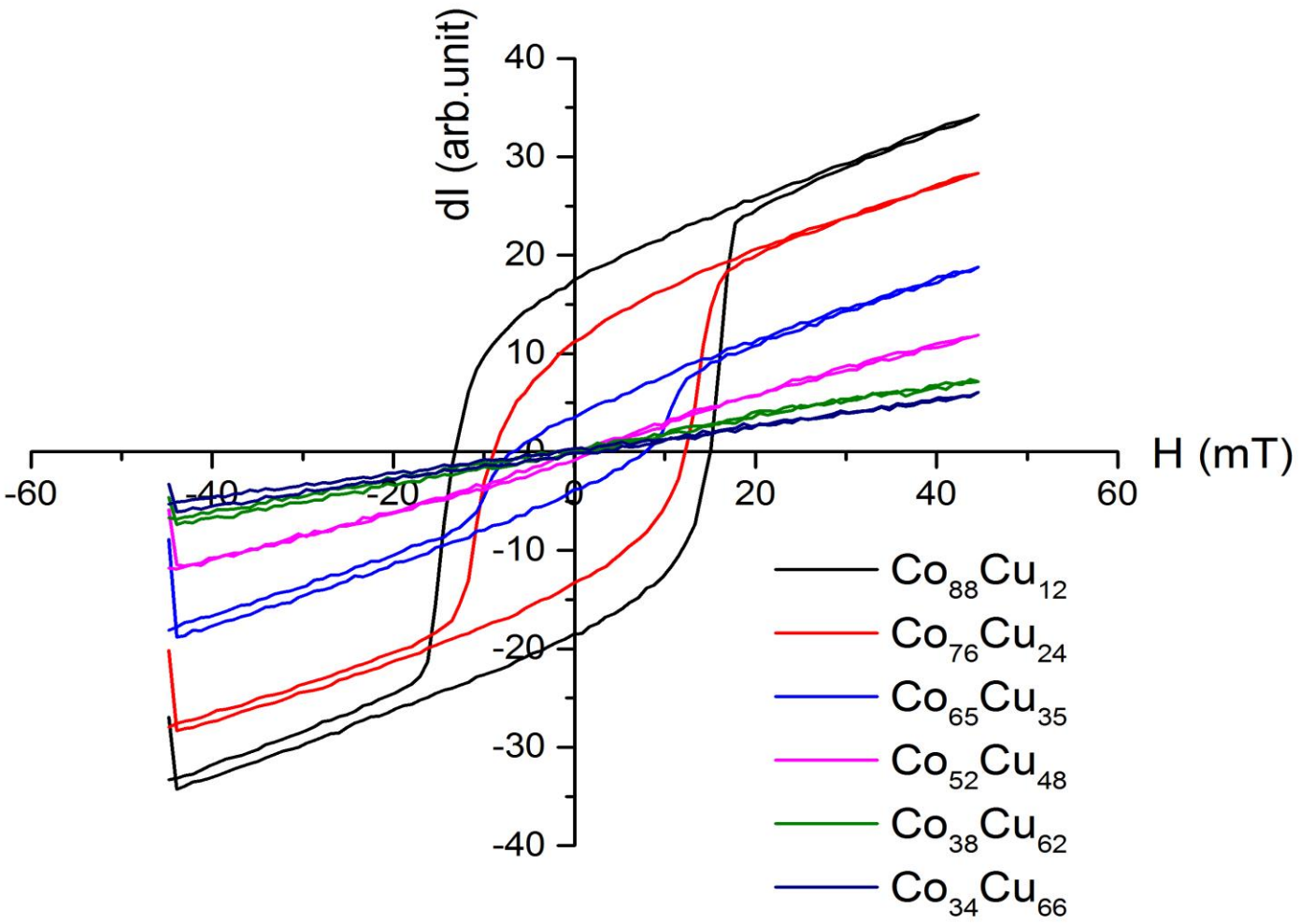
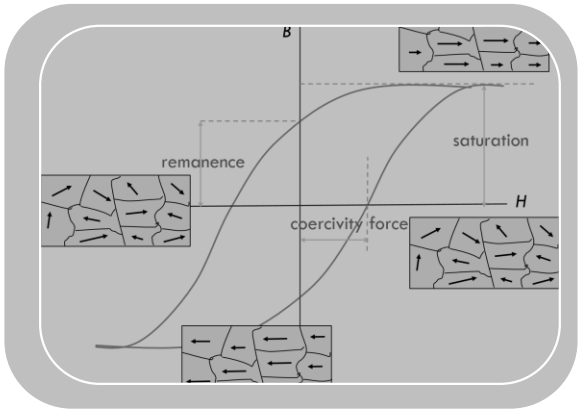
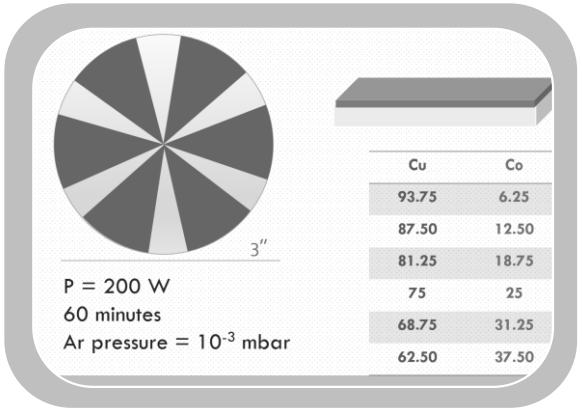


Fig 8. Hysteresis loops of Co_xCu_{100-x} films by MOKE.

Outline



Introduction



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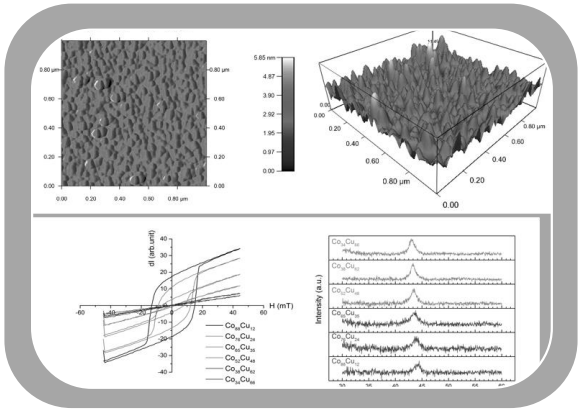

Results & Discussion

Conclusions

Conclusions

- The chemical composition of sputtered Co-Cu film is corresponding to target area.
- Sputtered Co-Cu film consisted of Co (111) dispersed in Cu (111) matrix.
- $Co_{88}Cu_{12}$ and $Co_{34}Cu_{66}$ displayed the regular grain distribution.
- Sputtered Co-Cu film revealed the separation of Co and Cu phase around 750°c
- $Co_{88}Cu_{12}$, $Co_{76}Cu_{24}$, $Co_{65}Cu_{35}$ and $Co_{52}Cu_{48}$ films exhibited ferromagnetic magnets but $Co_{38}Cu_{62}$ and $Co_{34}Cu_{66}$ were paramagnets.

- Thank You