

Comparative studies of properties of hexaferrites obtained by modified co precipitation methods

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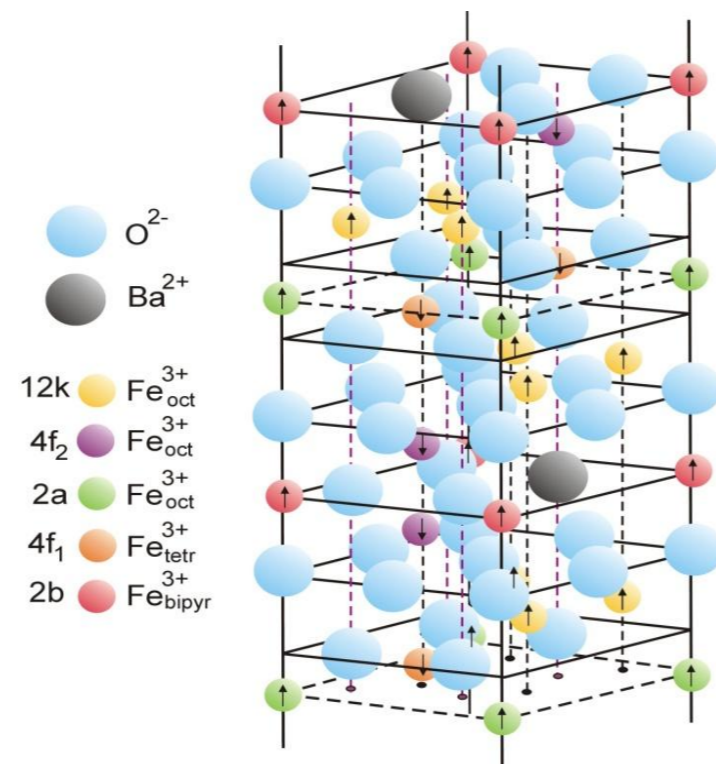
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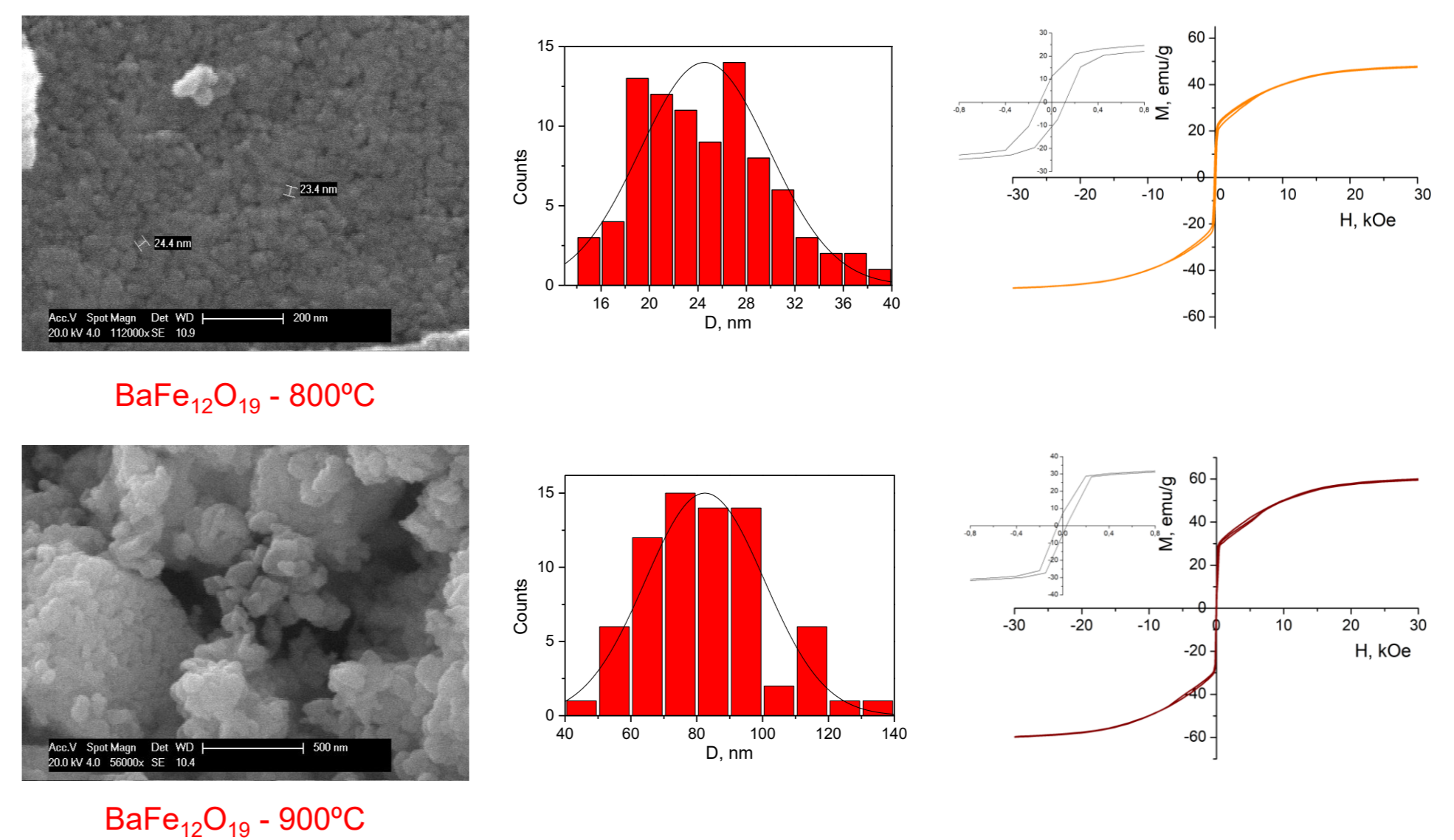
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INTRODUCTION & AIM

M-type hexaferrites are among the most important magnetic materials due to their applications as permanent magnets, magnetic recording media, microwave components and devices, etc. We report a study on the correlation between the synthesis procedure on the microstructure and the magnetic properties of BaFe₁₂O₁₉ nanopowders. These were synthesized by two modified co-precipitation methods: microemulsion co-precipitation and sonochemical co precipitation (sonochemistry).



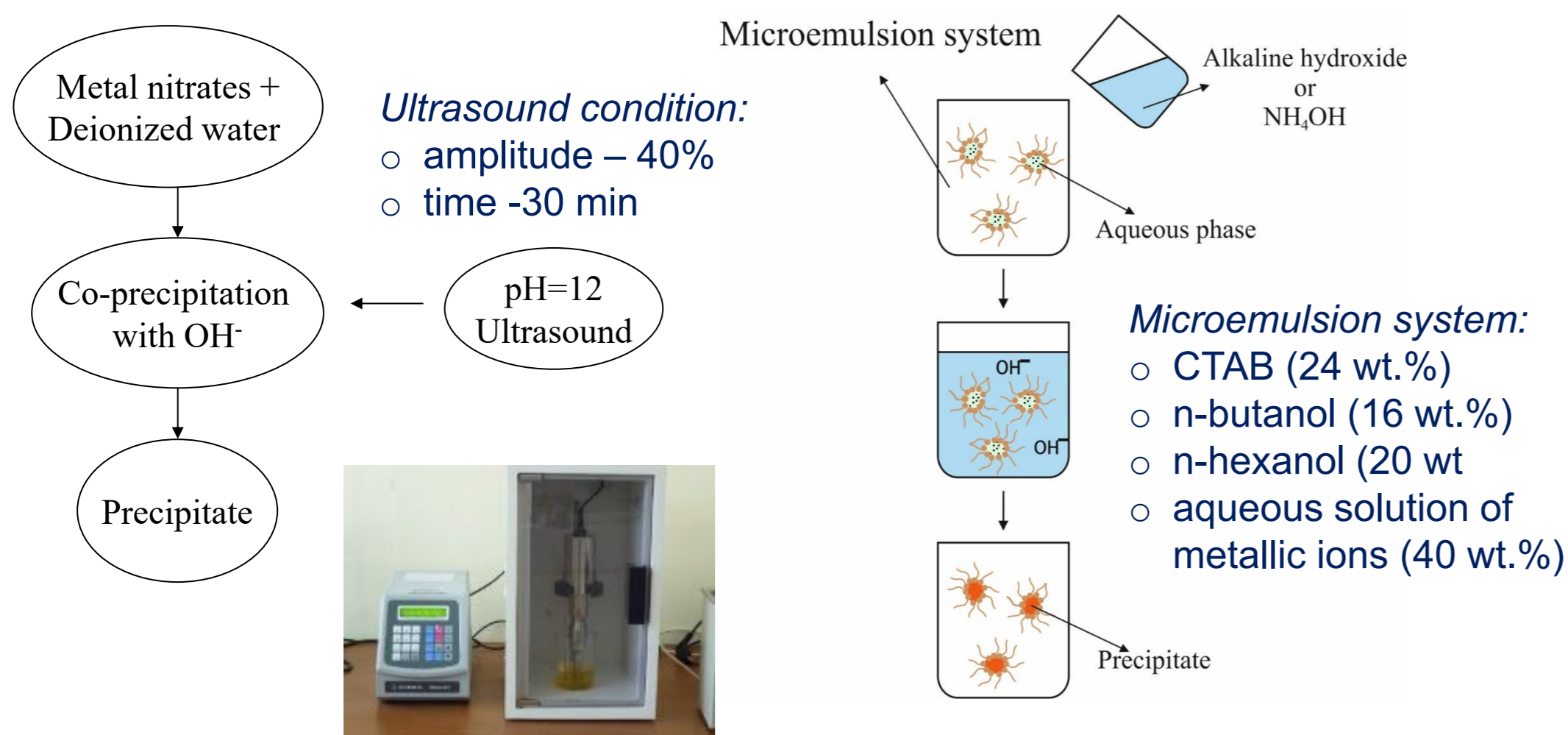
Sonochemical co-precipitation



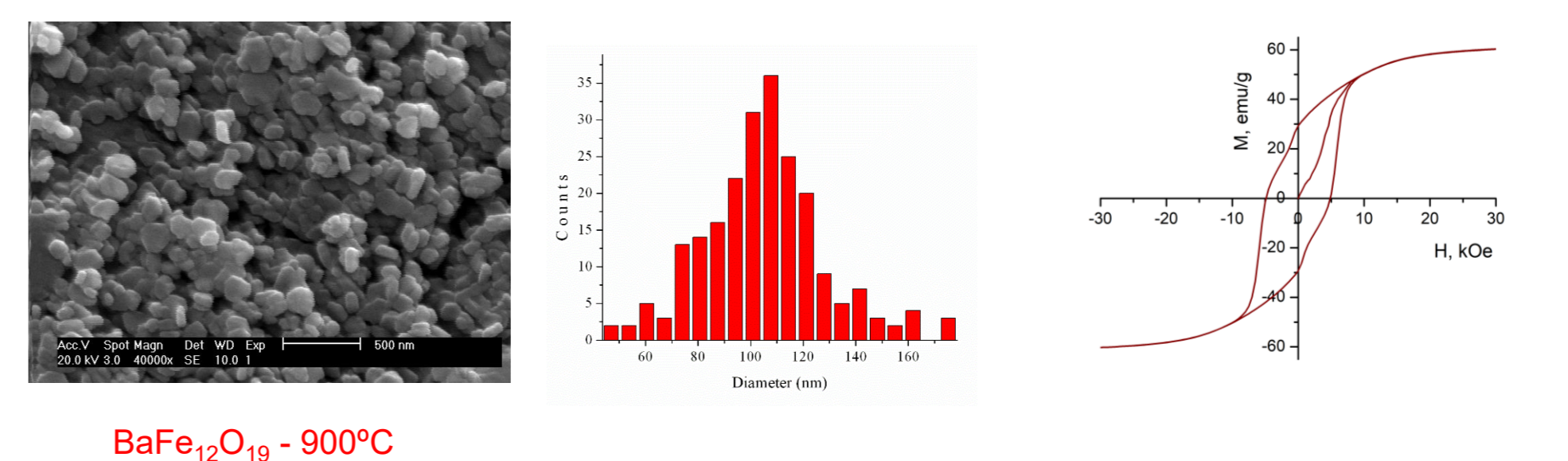
METHOD

Sonochemical co-precipitation method

Single microemulsion method



Single microemulsion co-precipitation



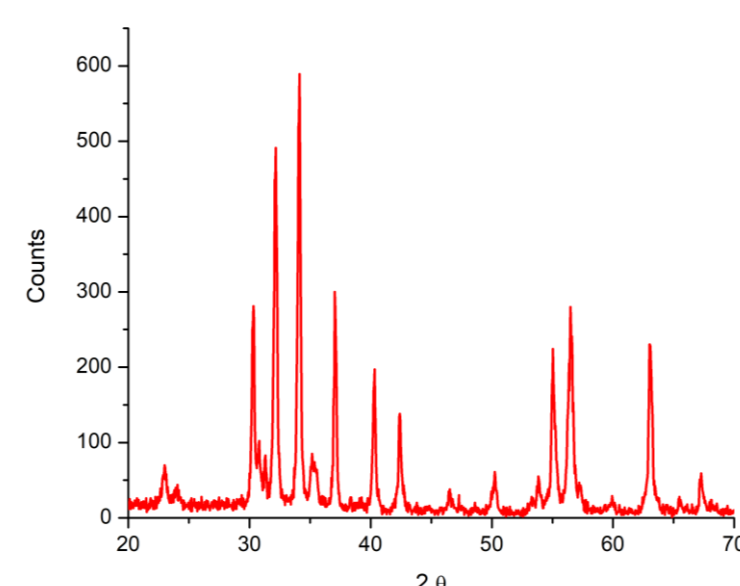
| Method | BaFe ₁₂ O ₁₉ | Average particle size (nm) | M _c (emu/g) 4.2K | H _c (Oe) 4.2K | M _c (emu/g) 300K | H _c (Oe) 300K |
|---------------|------------------------------------|----------------------------|-----------------------------|--------------------------|-----------------------------|--------------------------|
| sonochemistry | 800°C | 24 | 70 | 214 | 49 | 103 |
| sonochemistry | 900°C | 84 | 91 | 236 | 61 | 44 |
| microemulsion | 900°C | 130 | 90 | 4390 | 62 | 4340 |

The molar ratio of Ba to Fe is 1:10. The co-precipitation process was caused by adding NaOH at pH12. The precursors are synthesized at 800°C and 900°C to obtain BaFe₁₂O₁₉.

RESULTS & DISCUSSION

Single phase BaFe₁₂O₁₉:

- Synthesis at 800°C and 900°C for sonochemical co-precipitation method
- Synthesis at 900°C for single microemulsion method



CONCLUSION

The powders prepared by the modified co-precipitation method are very homogeneous and consist of particles with an irregular shape between spherical and plate hexagonal, which is typical for BaFe₁₂O₁₉. The sonochemical co-precipitation method allows one to obtain single-domain BaFe₁₂O₁₉ with particle size below 100 nm. The powder obtained by single microemulsion co-precipitation has high coercivity, while these obtained by sonochemistry present very narrow hysteresis curves - very low values. In conclusion, depending on the synthesis conditions, powder samples with controlled particle size and shape and desired magnetic properties can be obtained.

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