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Supplementary Material

Simple and Practical Synthesis of Various New Nickel Boride-based Nanocomposites and Their Applications for the Green and Expeditious Reduction of Nitroarenes to Arylamines under Wet Solvent-free Mechanochemical Grinding

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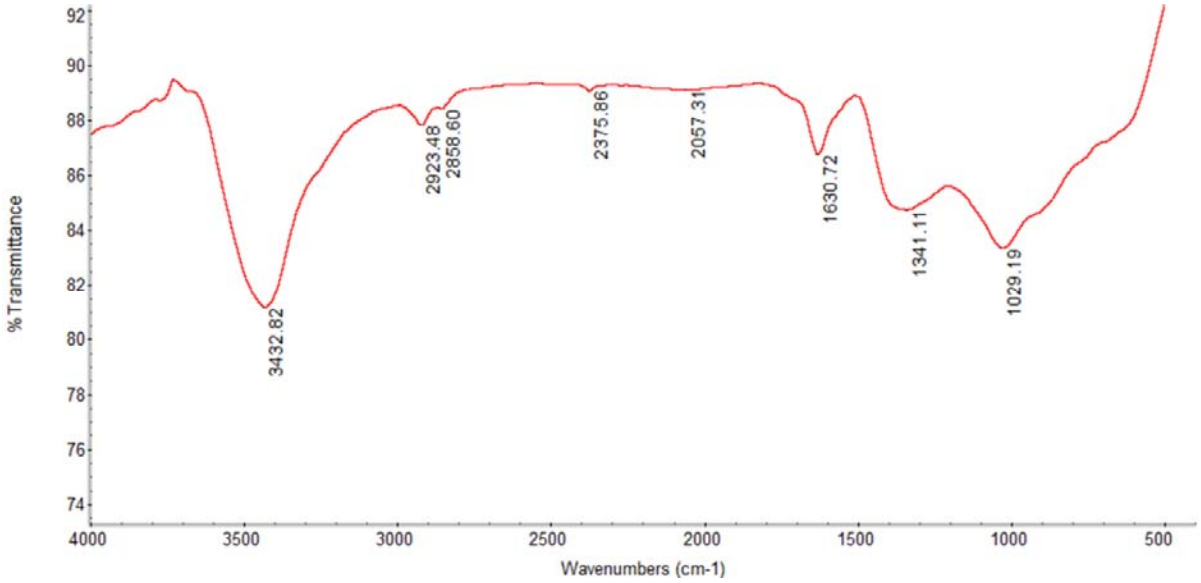
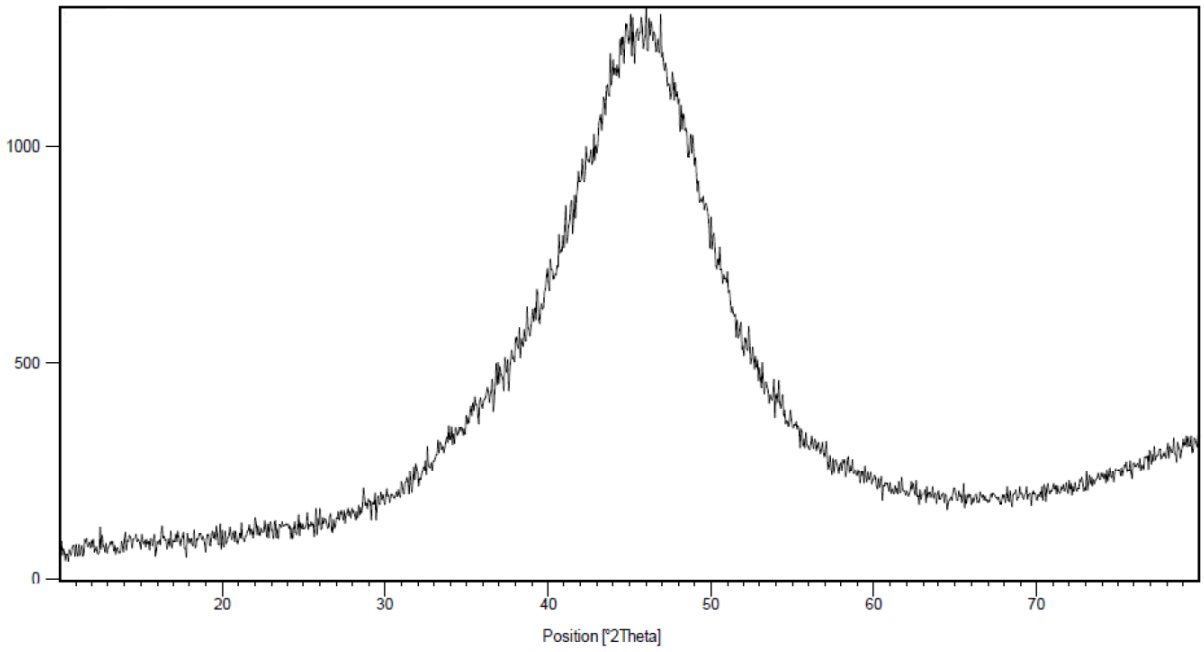
[B]Corresponding author. Email: 1Hossein.Mousavi@Gmail.Com

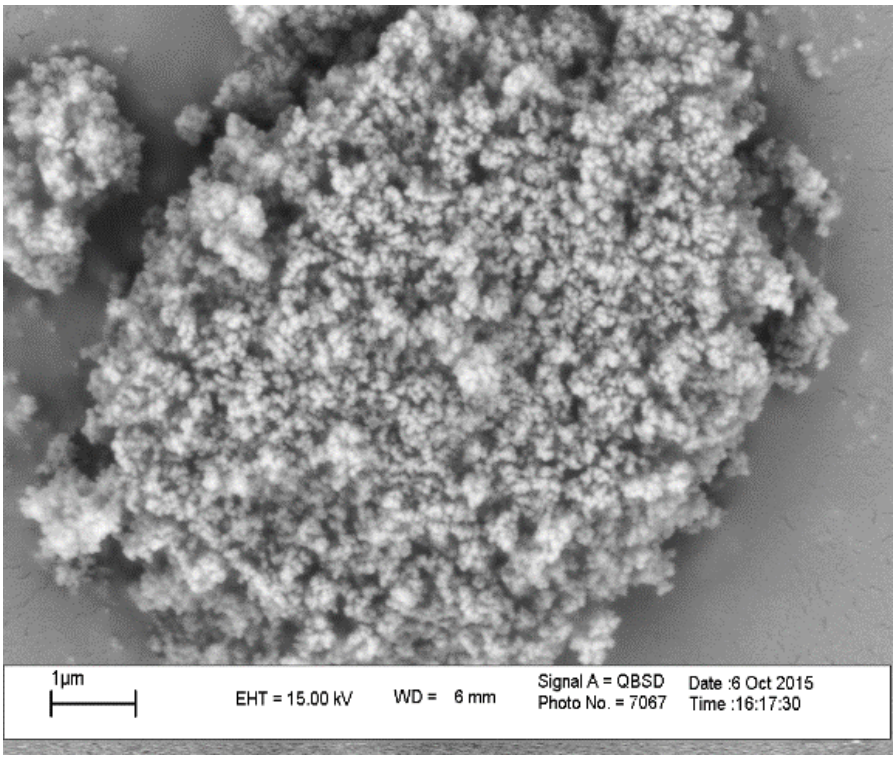
The FT-IR spectrum of Ni_2B nanoparticles.

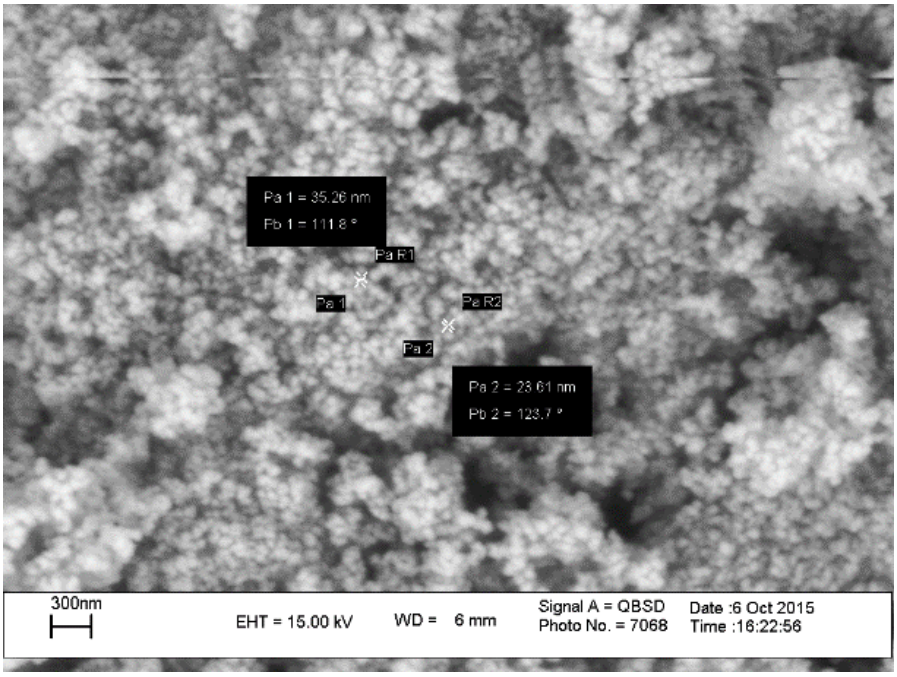


The XRD pattern of Ni_2B nanoparticles.

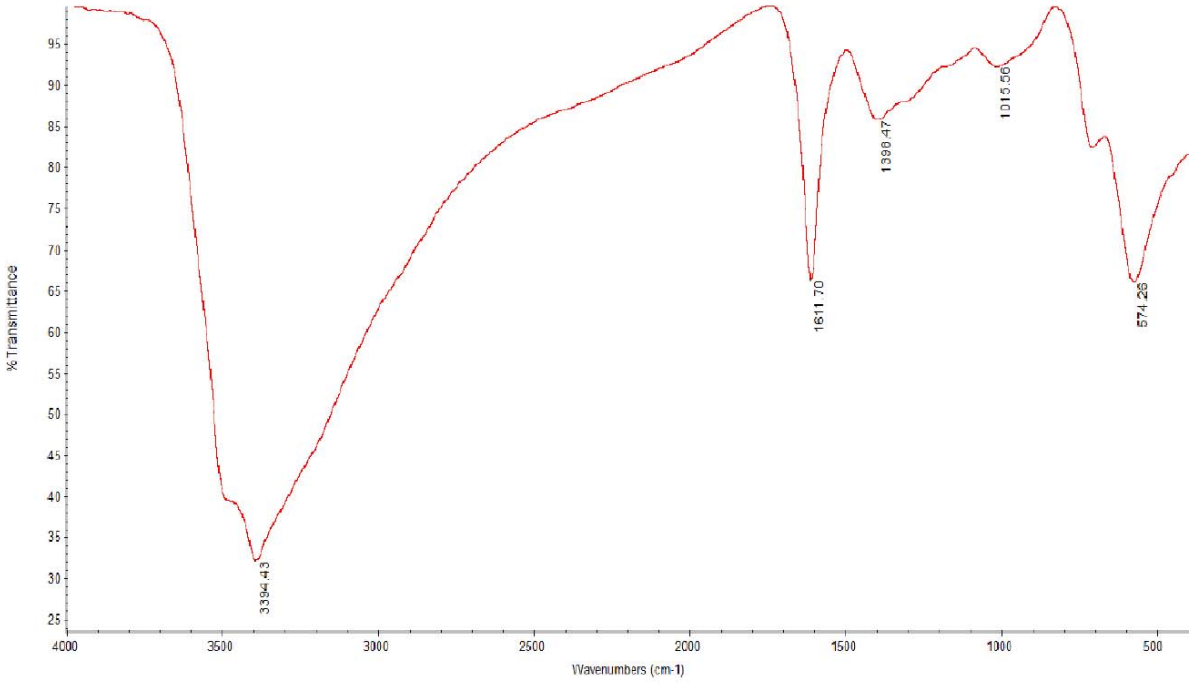


The SEM images of Ni_2B nanoparticles.





The FT-IR spectrum of $Ni_2B@ZrCl_4$.



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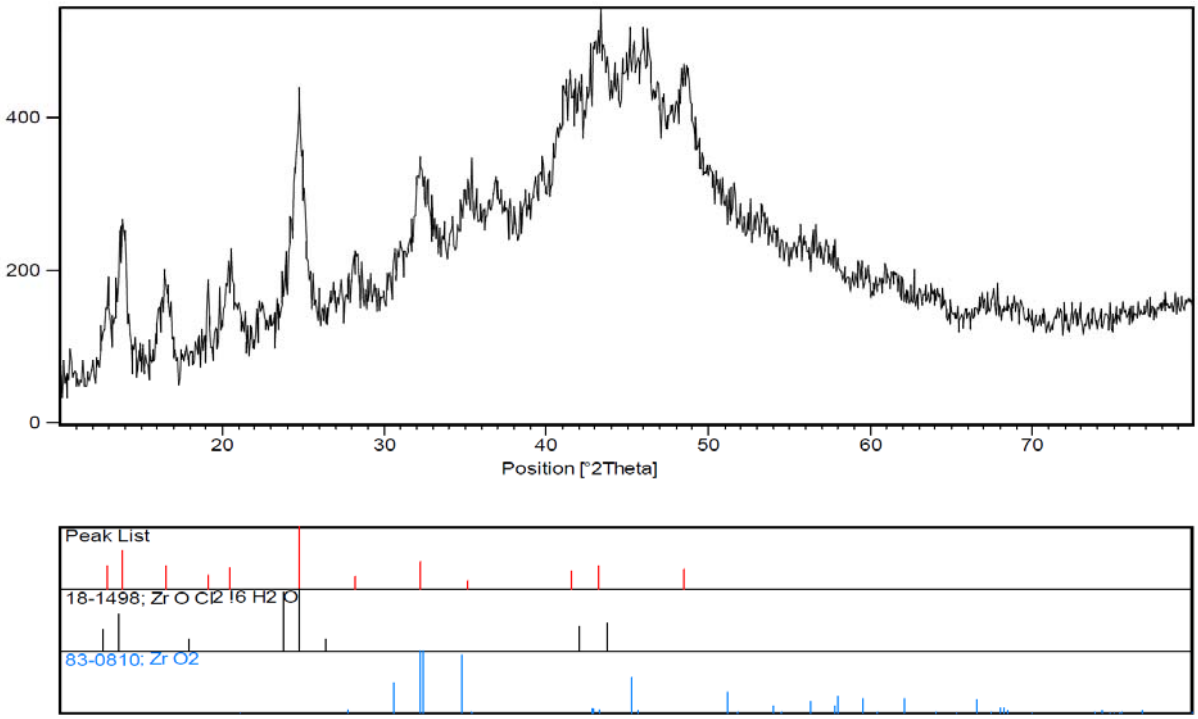

Compared and matched with:

[A] S. Guo, D. H. Ping, Y. Kagawa, *Ceram. Int.* **2012**, *38*, 5195.
[B] C. Liu, B. Liu, Y.-L. Shao, Z.-Q. Li, C.-H. Tang, *Trans. Nonferrous Met. Soc. China* **2008**, *18*, 728.
[C] F. C. Gennari, L. F. Albanesi, I. J. Rios, *Inorg. Chim. Acta* **2009**, *362*, 3731.
[D] D.-W. Lee, S.-M. Jin, J.-H. Yu, H.-M. Lee, *Mat. Trans.* **2010**, *51*, 2266.
[E] Y. Sun, B. Yao, Q. He, F. Su, H. Z. Wang, *J. Alloy. Comp.* **2009**, *479*, 599.

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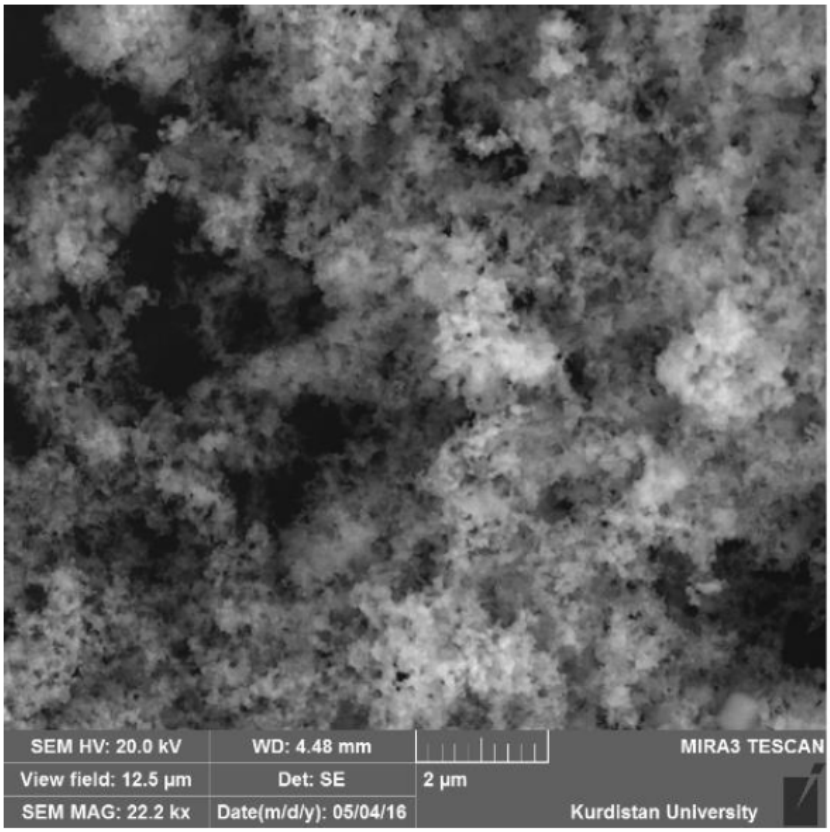
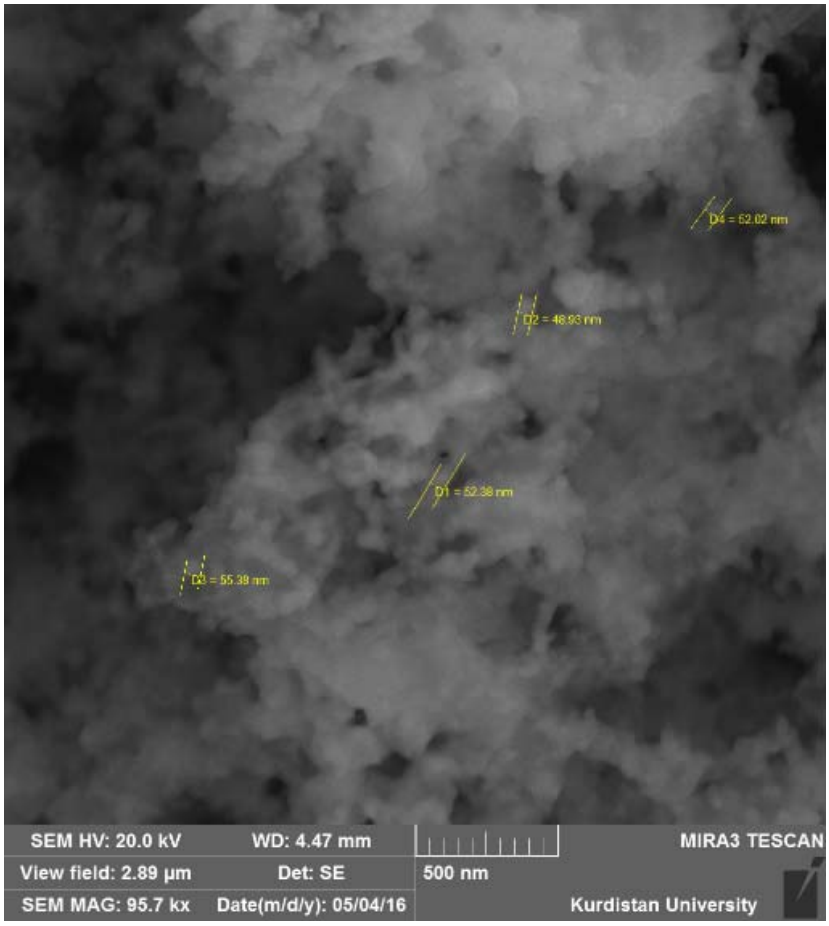
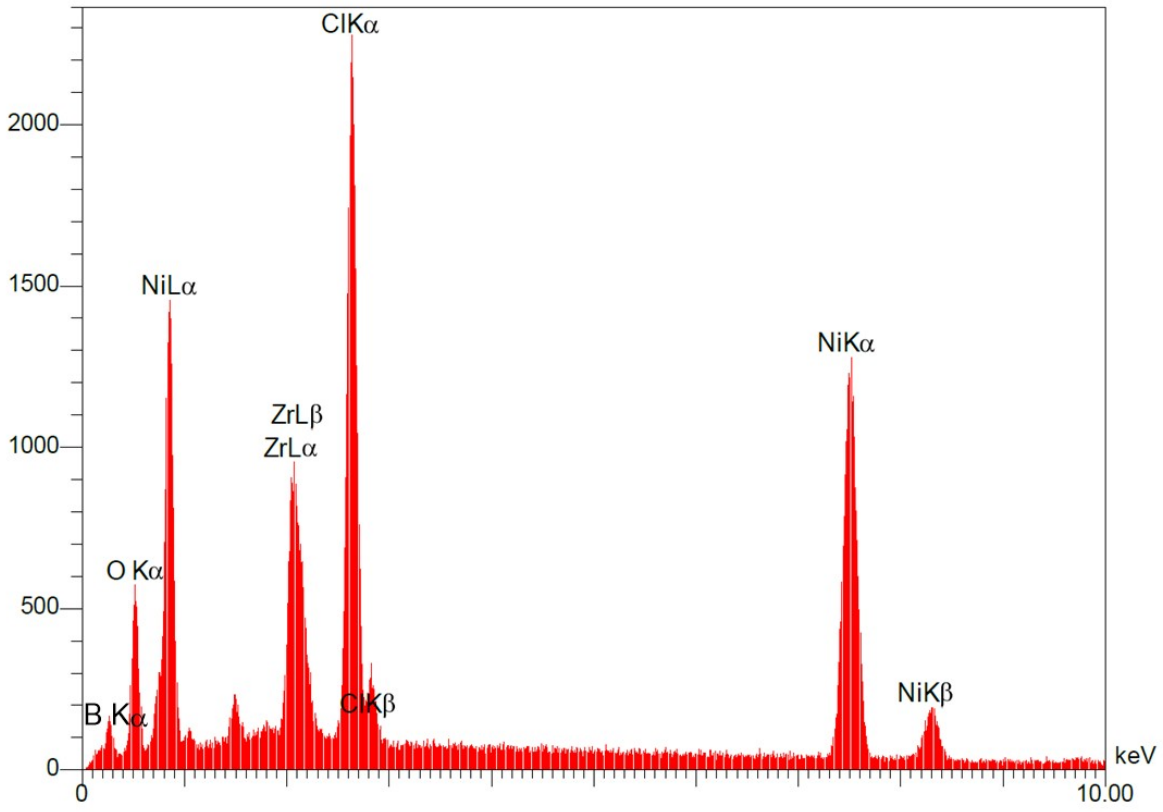
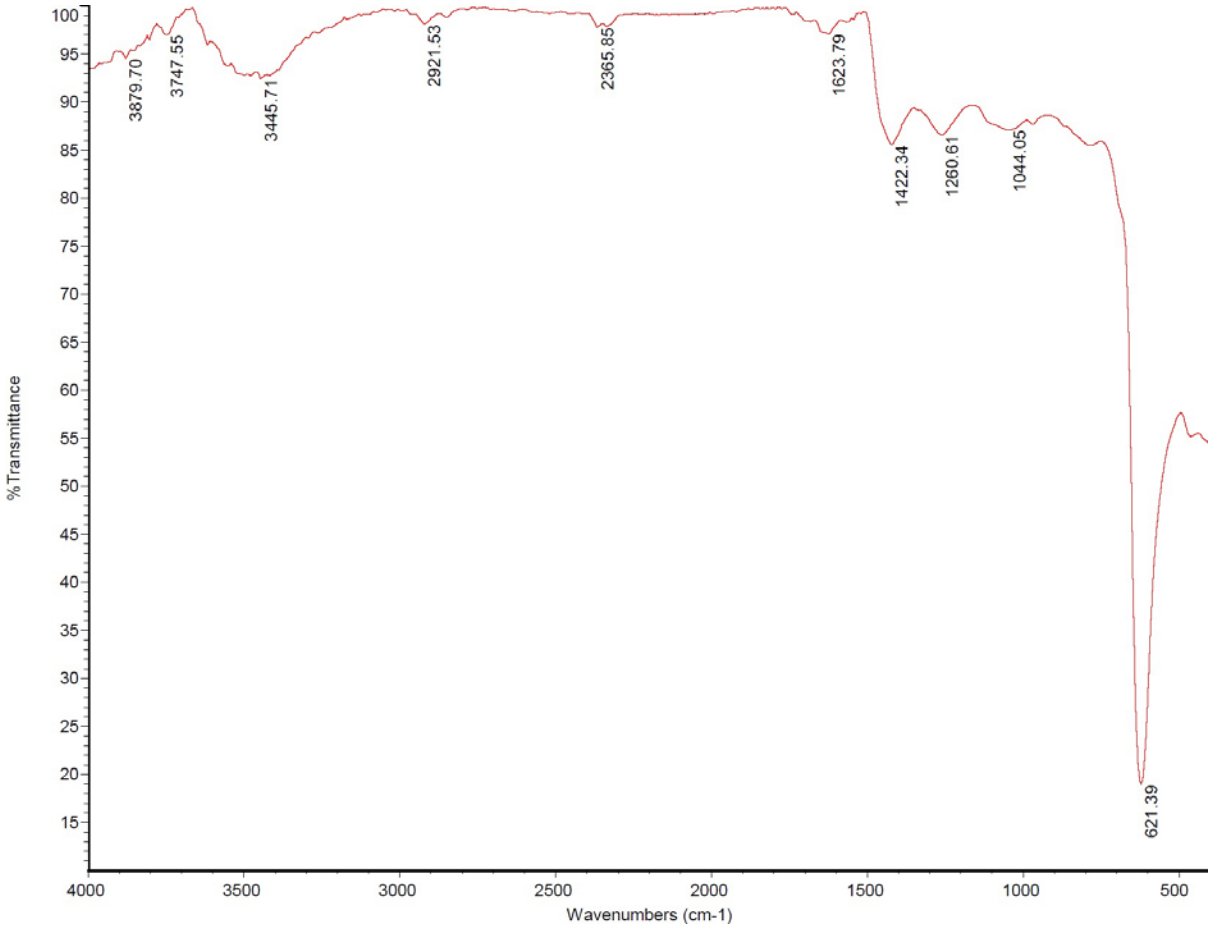




The EDX spectrum of $Ni_2B@ZrCl_4$.



The FT-IR spectrum of $Ni_2B@Cu_2O$.



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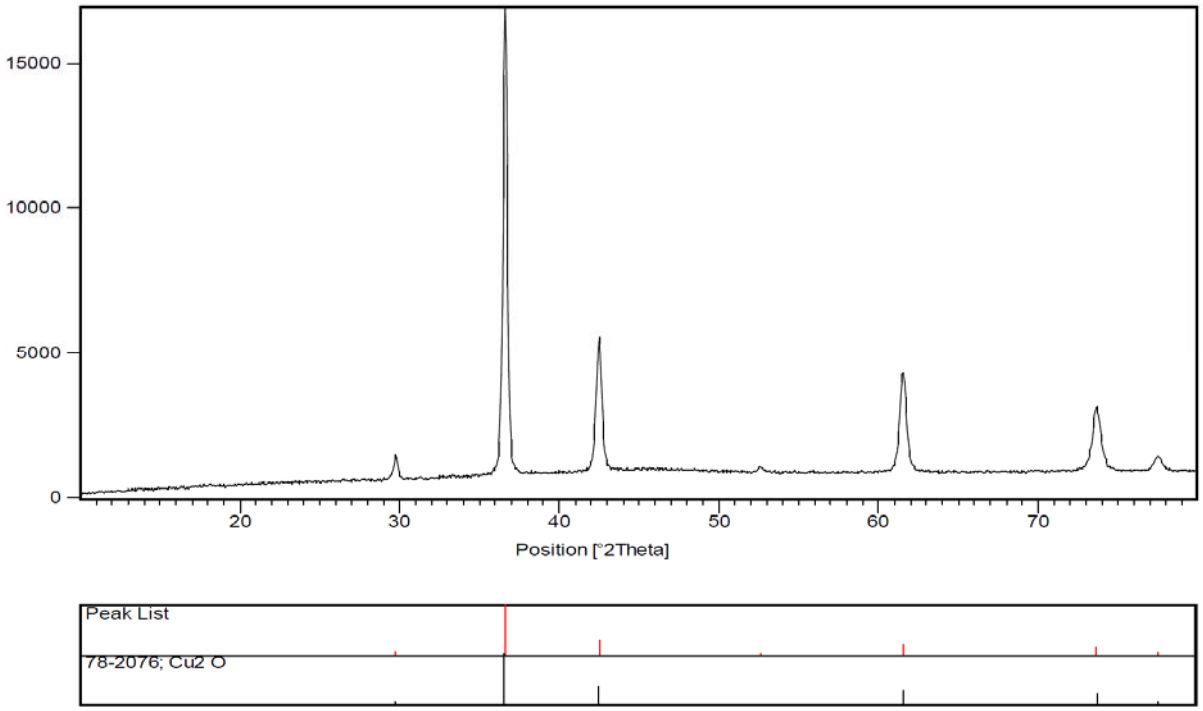

Compared and matched with:

[49] (a) X. Zhang, Y. Zhang, H. Huang, J. Cai, K. Ding, S. Lin, *New J. Chem.* **2018**, *42*, 458.
(b) A. L. Gajengi, C. S. Fernandes, B. M. Bhanage, *Mol. Catal.* **2018**, *451*, 13.
(c) S. Meghana, P. Kabra, S. Chakraborty, N. Padmavathy, *RSC Adv.* **2015**, *5*, 12293.
(d) C. Qi, J. Zheng, *Electroanalysis* **2016**, *28*, 477.
(e) M. Salavati-Niasari, F. Davar, *Mater. Lett.* **2009**, *63*, 441.
(f) W. Wang, Y. Tu, P. Zhang, G. Zhang, *CrystEngComm* **2011**, *13*, 1838.
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(h) T. Jiang, T. Xie, L. Chen, Z. Fu, D. Wang, *Nanoscale* **2013**, *5*, 2938.
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(j) F. Zhang, G. Dong, M. Wang, Y. Zeng, C. Wang, *Appl. Surf. Sci.* **2018**, *444*, 559.
(k) M. Iqbal, Y. Wang, H. Hu, M. He, A. H. Shah, L. Lin, P. Li, K. Shao, A. R. Woldu, T. He, *Appl. Surf. Sci.* **2018**, *443*, 209.

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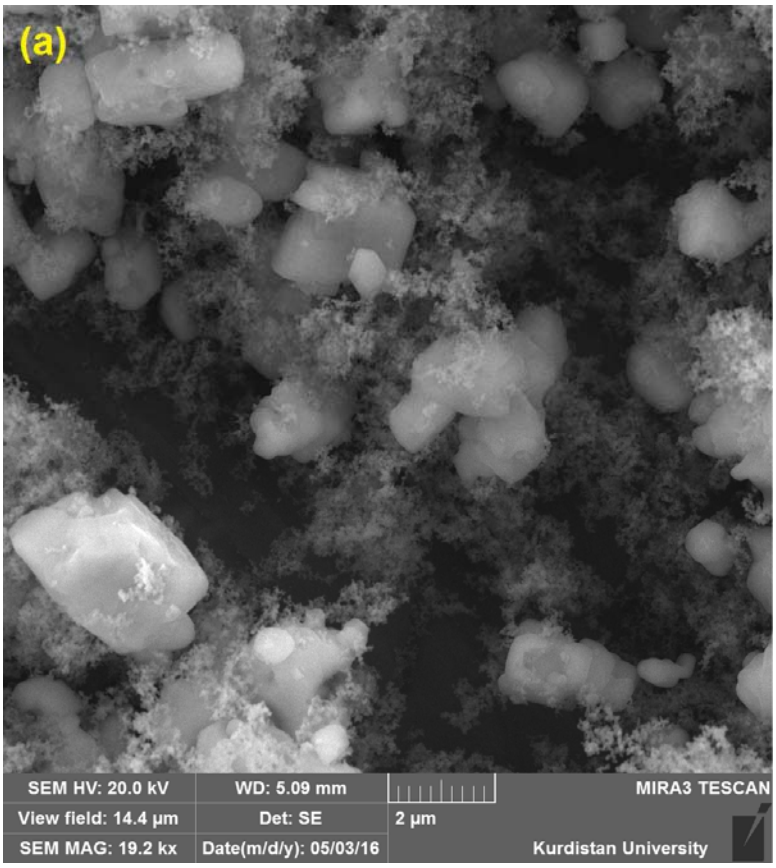

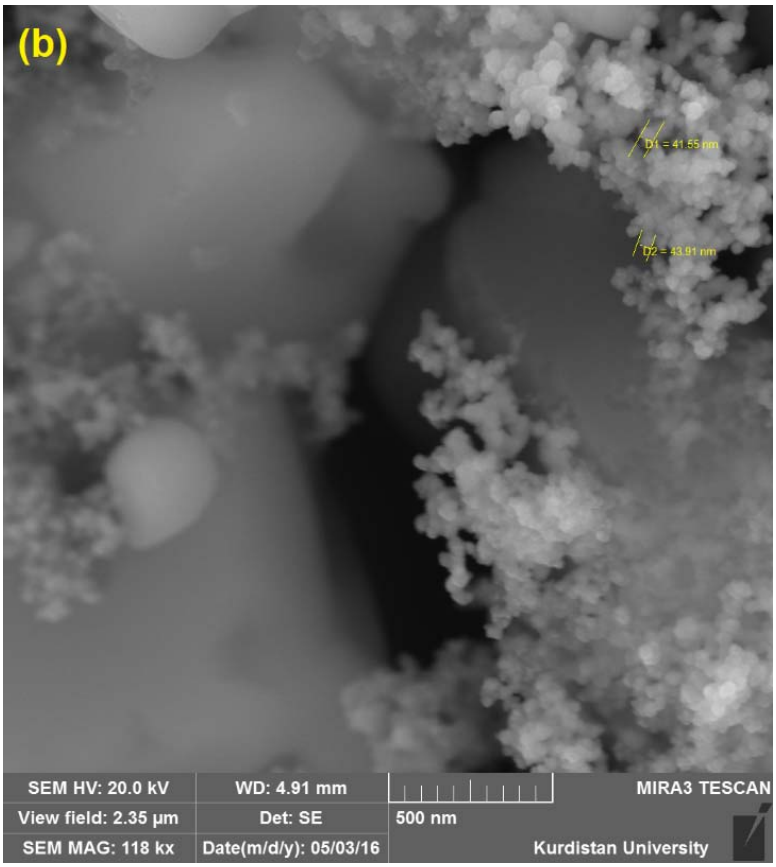

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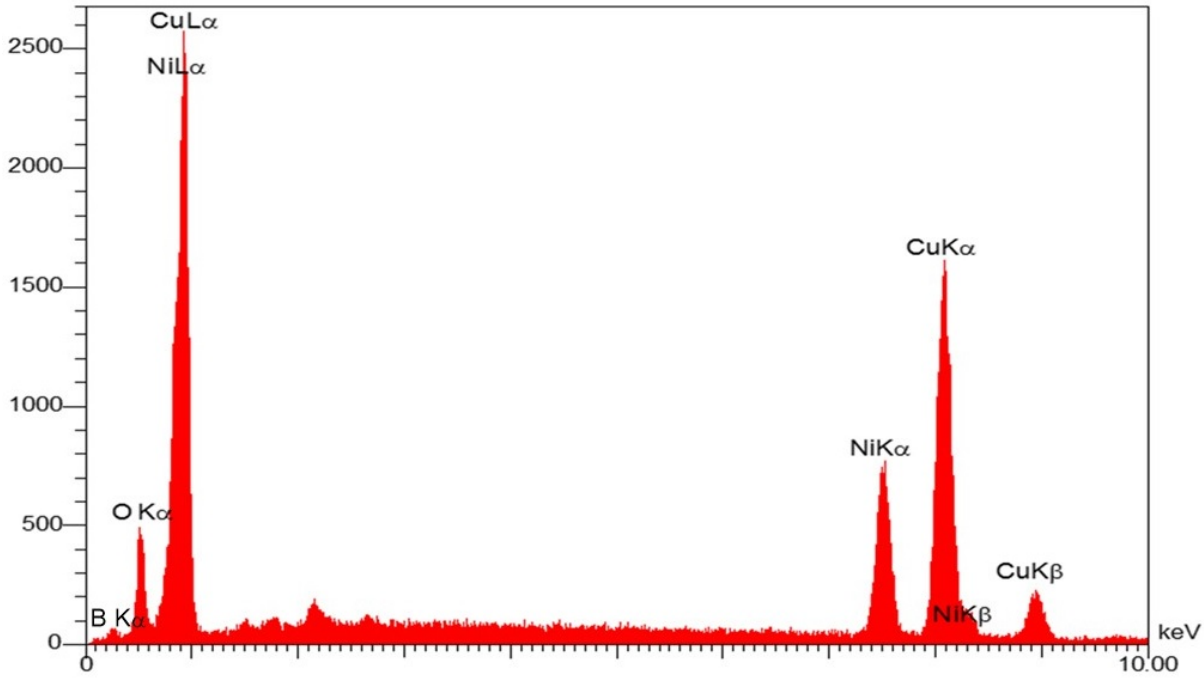

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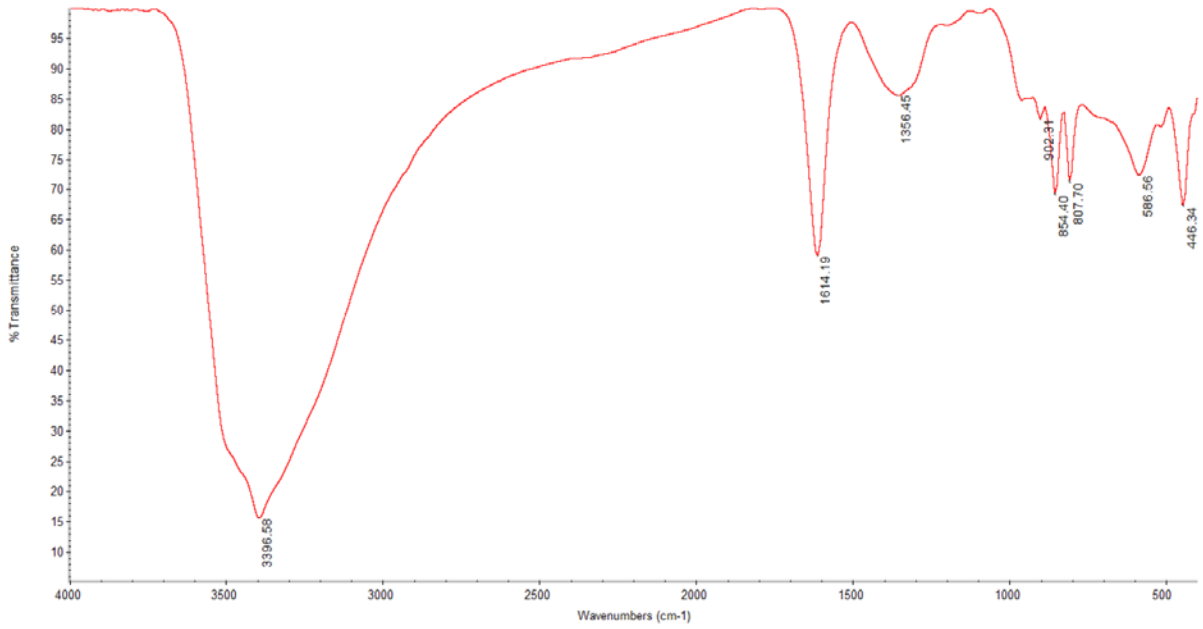

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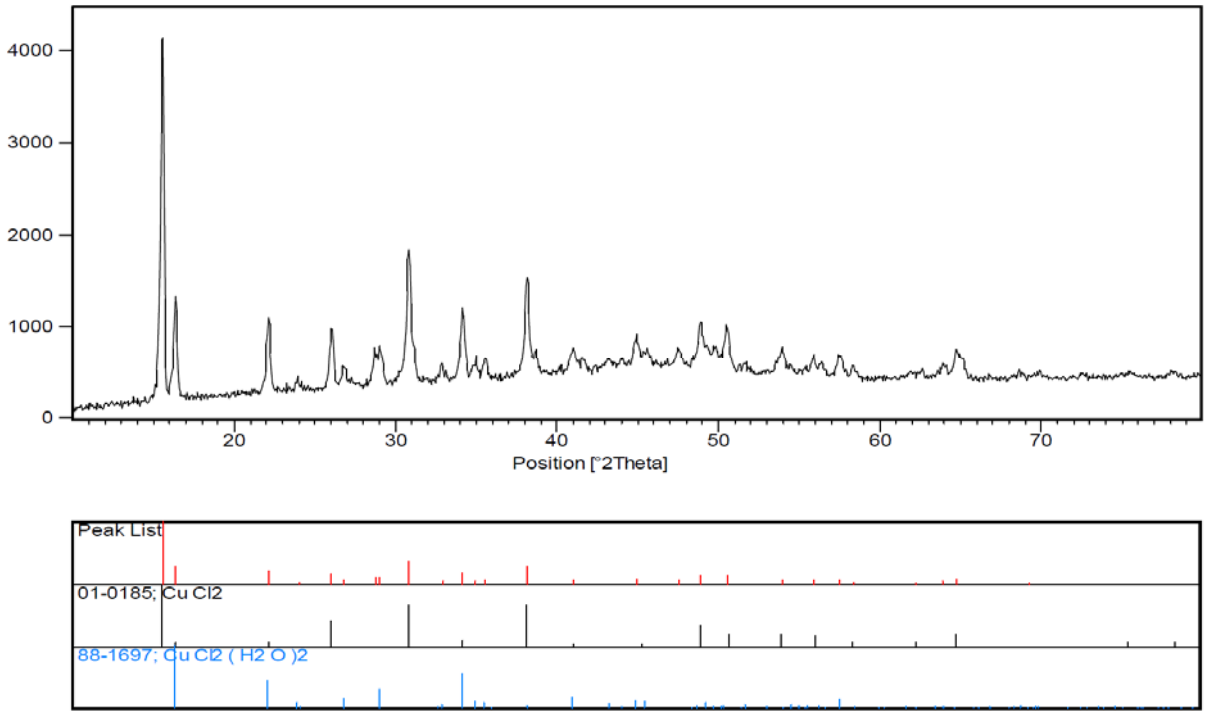

Compared and matched with:

[A] G. F. Naterer, S. Suppiah, L. Stolberg, M. Lewis, M. Ferrandon, Z. Wang, I. Dincer, K. Gabriel, M. A. Rosen, E. Secnik, E. B. Easton, L. Trevani, I. Pioro, P. Tremaine, S. Lvov, J. Jiang, G. Rizvi, B. M. Ikeda, L. Lu, M. Kaye, W. R. Smith, J. Mostaghimi, P. Spekkens, M. Fowler, J. Arsec, *Int. J. Hydrogen Energy* **2011**, *36*, 15472.

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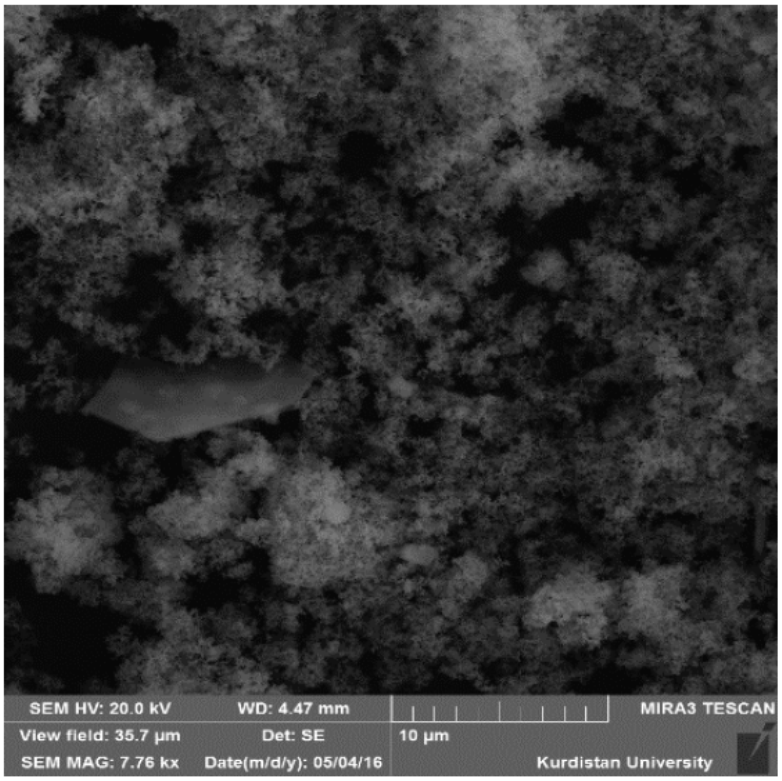

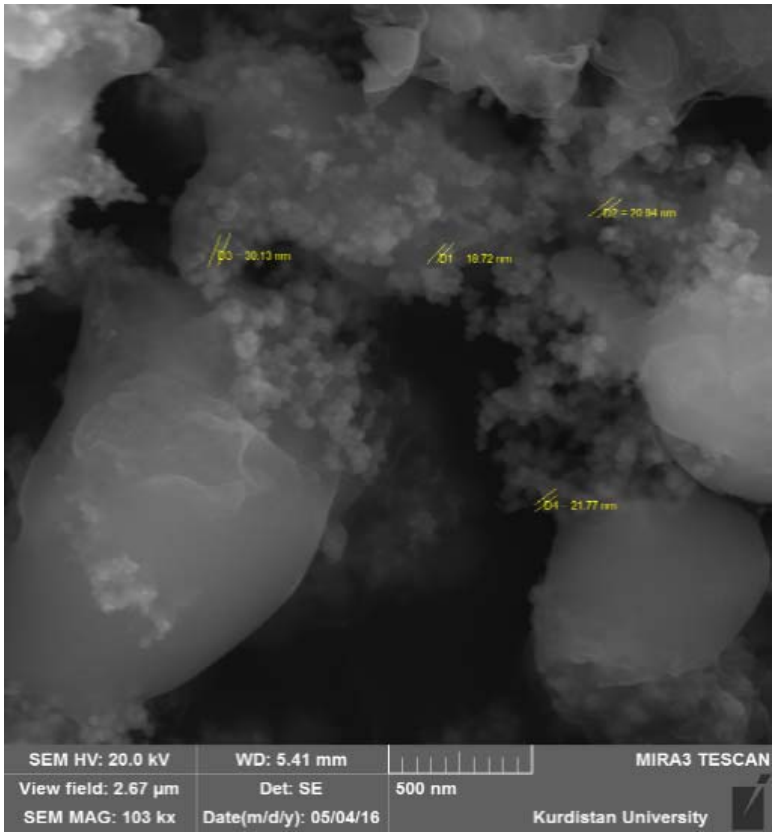

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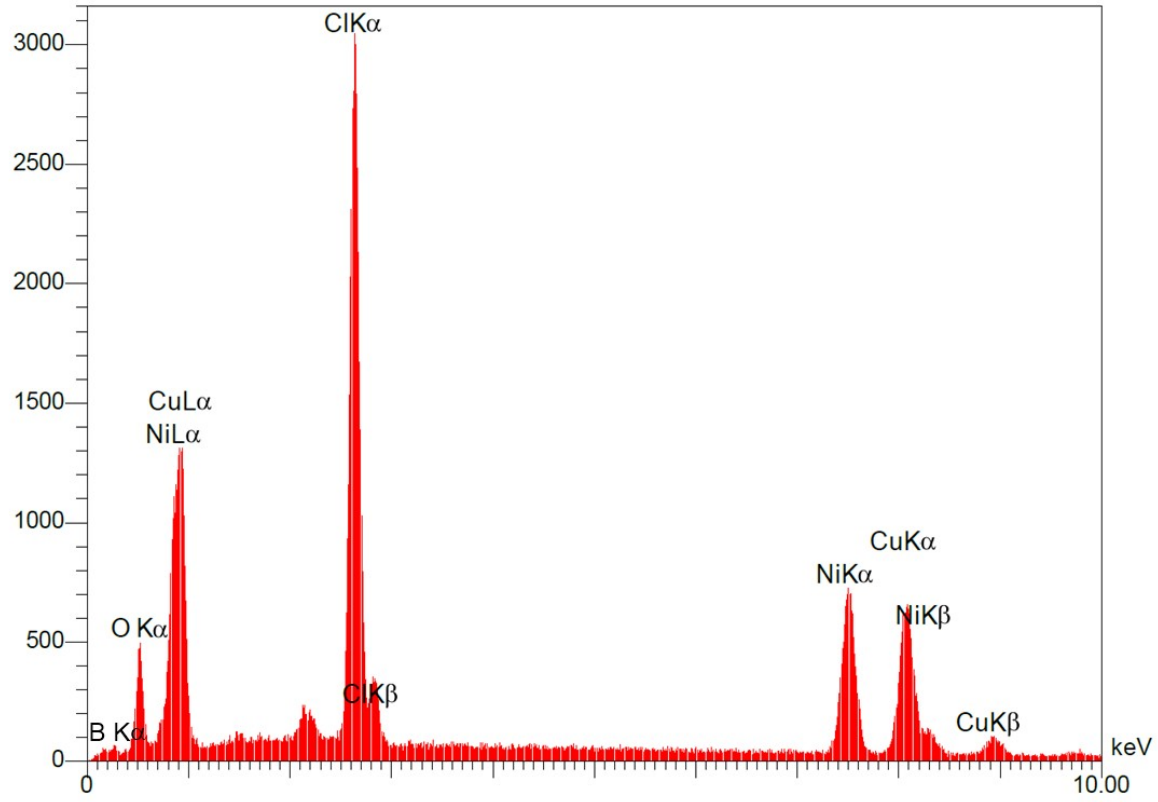
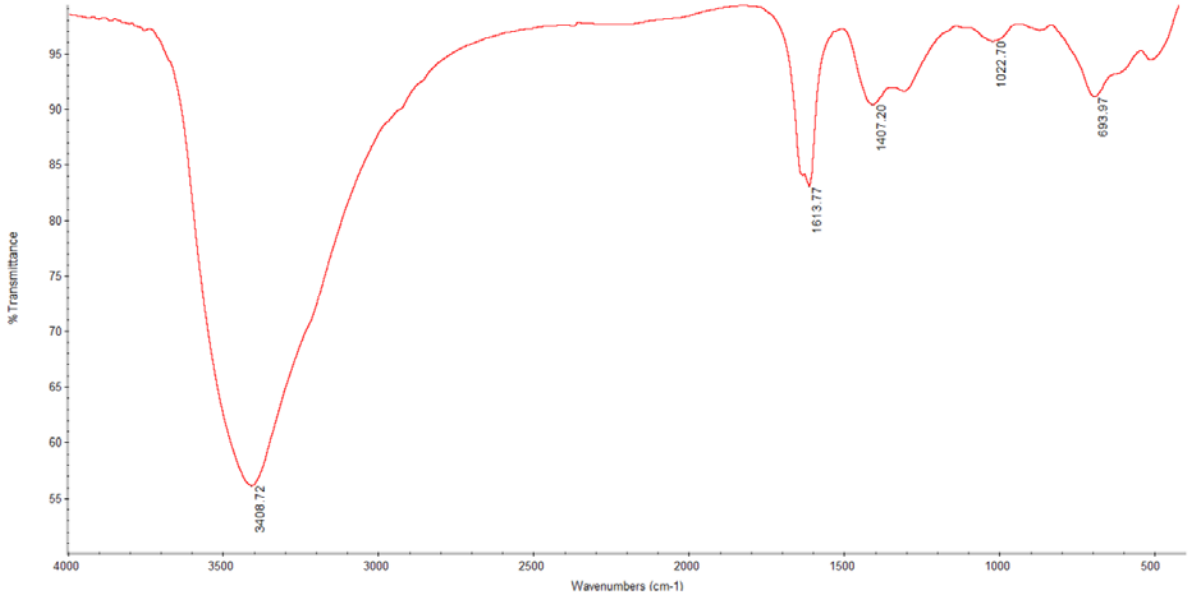


The FT-IR spectrum of $Ni_2B@FeCl_3$.



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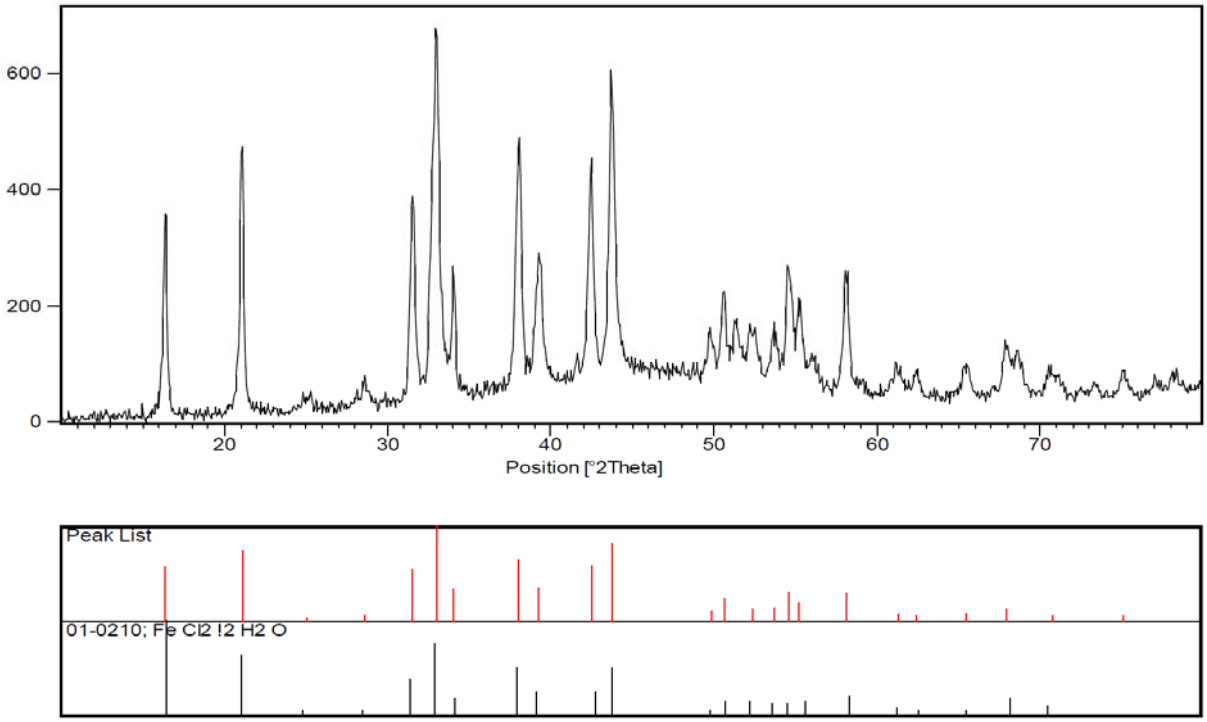

Compared and matched with:

[A] Y. Lu, Z.-Y. Wen, J. Jin, X.-W. Wu, K. Rui, *Chem. Commun.* **2014**, *50*, 6487.
[B] N. Louvain, A. Fakhry, P. Bonnet, M. El-Ghozzi, K. Guérin, M.-T. Sougrati, J.-C. Jumas, P. Willmann, *CrysEngComm* **2013**, *15*, 3664.

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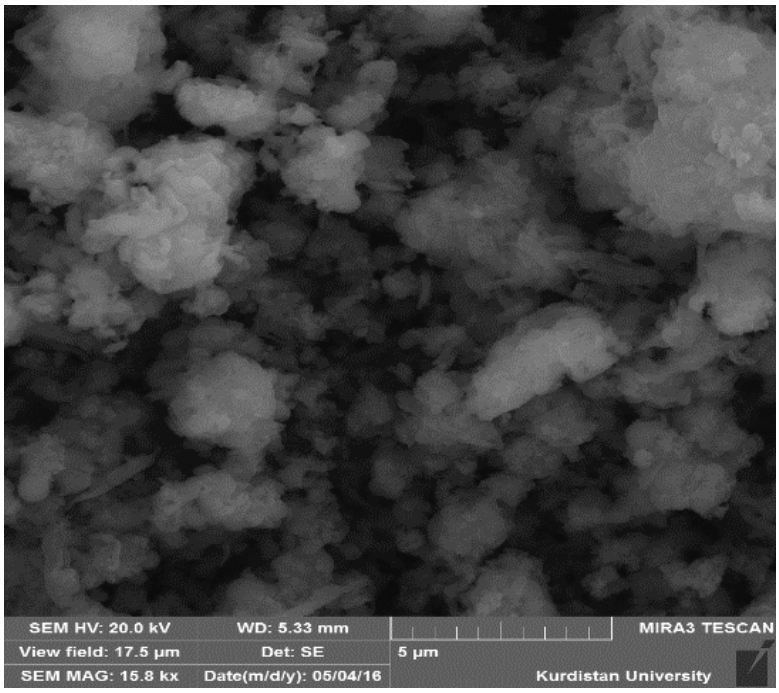

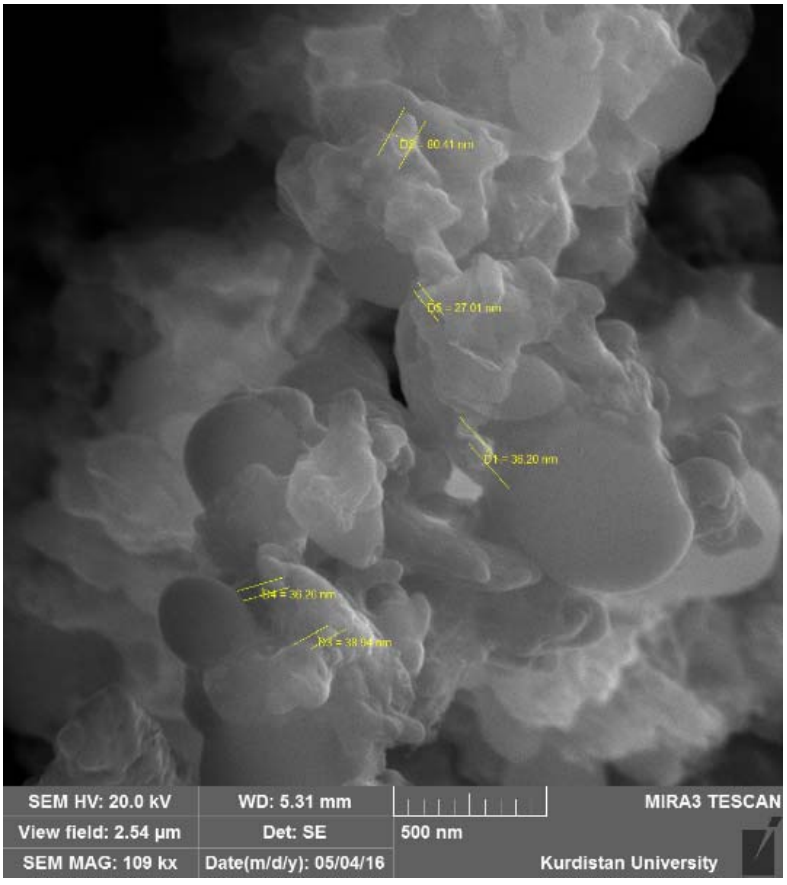

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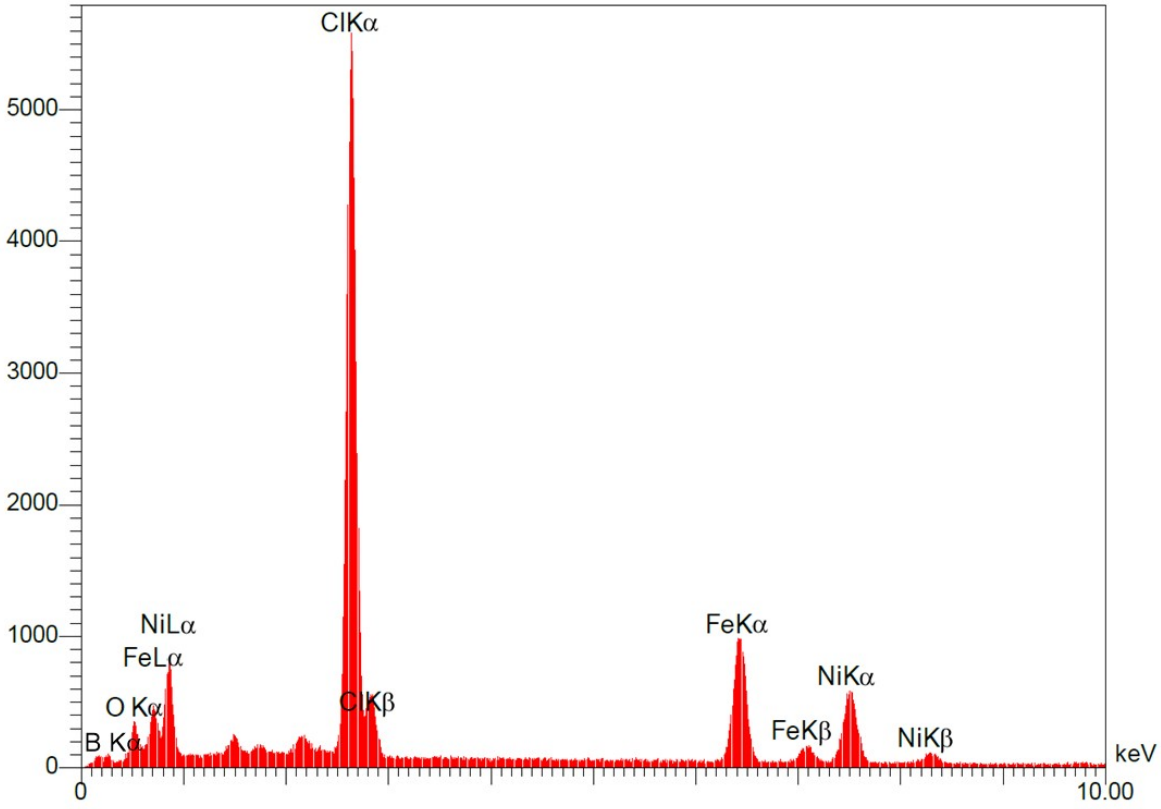

Selected spectral data of products

Aniline

FT-IR (KBr): 3432, 3357, 3215, 3034, 1618, 1497, 1275, 1173, 880, 753, 690, 501 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): 7.20 (t, *J* = 7.5 Hz, 2H, Ar), 6.80 (t, *J* = 7.2 Hz, 1H, Ar), 6.72 (d, *J* = 7.8 Hz, 2H, Ar), 3.60 (bs, 2H, NH_2).

(2-Aminophenyl)methanol

FT-IR (KBr): 3388, 3182, 2890, 1617, 1451, 1340, 1265, 1216, 1000, 929, 748, 457 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): 7.13 (t, *J* = 7.8 Hz, 1H, Ar), 7.03 (d, *J* = 7.5 Hz, 1H, Ar), 6.75-6.65 (m, 2H, Ar), 4.59 (s, 2H, CH_2), 3.55 (s, 3H, NH_2 and OH).

(4-Aminophenyl)methanol

FT-IR (KBr): 3347, 3236, 3028, 2923, 2869, 1612, 1515, 1432, 1277, 1175, 1003, 828, 697, 591, 495 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): 7.09 (d, *J* = 8.1 Hz, 2H, Ar), 6.60 (d, *J* = 8.4 Hz, 2H, Ar), 4.46 (s, 2H, CH_2), 2.96 (bs, 3H, NH_2 and OH).

Benzene-1,4-diamine

FT-IR (KBr): 3384, 3312, 3210, 2927, 1626, 1514, 1314, 1259, 1125, 833, 721 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): 6.57 (s, 4H, Ar), 3.33 (bs, 4H, NH_2).

(3-Amino-4-chlorophenyl)methanol

FT-IR (KBr): 3330, 3192, 3091, 2927, 2852, 1616, 1483, 1436, 1373, 1303, 1224, 1151, 1116, 1024, 903, 869, 804, 728, 602, 559, 474 cm^{-1}. ^1H NMR (300 MHz, $CDCl_3$): 7.28-7.20 (m, 1H, Ar), 6.79 (s, 1H, Ar), 6.67 (d, *J* = 8.1 Hz, 1H, Ar), 4.58 (s, 2H, CH_2), 3.11 (bs, 3H, NH_2 and OH).