## Appendix A. Supplementary Material

**Optimization of removal of anionic and cationic dyestuffs from aqueous solution with Cinnamon bark as low-cost and eco-friendly adsorbent**

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Table A.1. Properties of used dyestuffs

|  |  |  |
| --- | --- | --- |
| Trade name | Indigo Carmine (IC) | Malachite Green (MG) |
| IUPAC name | 5,5-indigosulfonic acid sodium salt | 4-[(4-dimethylamino phenyl) phenyl-methyl]-  N,N Dimethylaniline |
| Molecular Structure |  | basic green 4 molecular ile ilgili gÃ¶rsel sonucu |
| Molecular Formula | C16H8N2O8S2Na2 | C23H25ClN2 |
| Molecular Weight (g/mol) | 466.4 | 364.9 |
| *λ*max (nm) | 608 | 616 |

Table A.2. CCD design matrix and the selected factors for (a) IC and (b) MG adsorption onto Cinnamon bark

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Factors | | |  | (a) | | | | | |  | | (b) | | | | | |
|  | Levels of factors | | | | | |  | | Levels of factors | | | | | |
|  | -α  (-1.414) | -1 | 0 | +1 | +α  (+1.414) | |  | | -α  (-1.414) | -1 | 0 | | +1 | +α  (+1.414) |
| *X*1: initial dyestuff concentration (mg/L) | | |  | 20 | 32 | 60 | 88 | 100 | |  | | 20 | 32 | 60 | | 88 | 100 |
| *X*2: adsorbent amount (g) | | |  | 0.20 | 0.46 | 1.10 | 1.74 | 2.00 | |  | | 0.01 | 0.08 | 0.26 | | 0.43 | 0.50 |
| Run |  | Coded levels | |  | Actual levels | | | |  | | Actual levels | | | | | | |
|  | *X*1 | *X*2 |  | Co (mg/L) | m (g) | | |  | | Co (mg/L) | | | | m (g) | | |
| 1 |  | -1 | -1 |  | 32 | 0.46 | | |  | | 32 | | | | 0.08 | | |
| 2 |  | 1 | -1 |  | 88 | 0.46 | | |  | | 88 | | | | 0.08 | | |
| 3 |  | -1 | 1 |  | 32 | 1.74 | | |  | | 32 | | | | 0.43 | | |
| 4 |  | 1 | 1 |  | 88 | 1.74 | | |  | | 88 | | | | 0.43 | | |
| 5 |  | -1.414 | 0 |  | 20 | 1.10 | | |  | | 20 | | | | 0.26 | | |
| 6 |  | 1.414 | 0 |  | 100 | 1.10 | | |  | | 100 | | | | 0.26 | | |
| 7 |  | 0 | -1.414 |  | 60 | 0.20 | | |  | | 60 | | | | 0.01 | | |
| 8 |  | 0 | 1.414 |  | 60 | 2.00 | | |  | | 60 | | | | 0.50 | | |
| 9-13 |  | 0 | 0 |  | 60 | 1.10 | | |  | | 60 | | | | 0.26 | | |

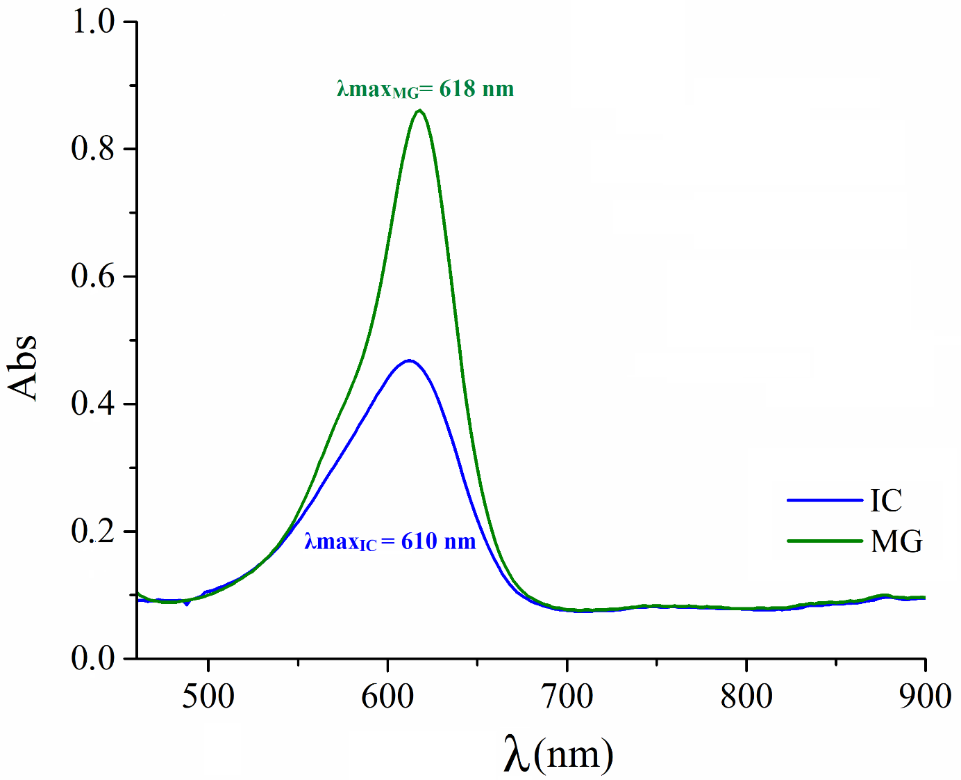


Figure A.1. Absorbance spectra obtained for IC and MG dyestuffs



Figure A.2. pHpzc for Cinnamon bark

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

Figure A.3. Fitting curves of (a,b) pseudo-second-order model for IC and MG adsorption

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