**Supplementary Material**

Taguchi DoE methodology for modeling of synthetic dye biosorption from aqueous effluents: Parametric and phenomenological studies

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Fig. 1. Effect of contact time.

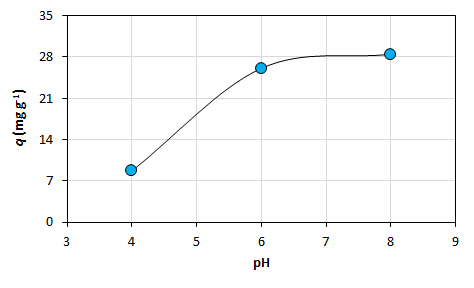


Fig. 2. Effect of pH.

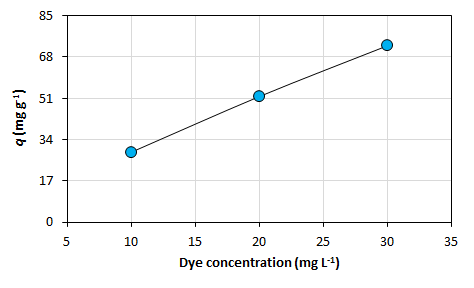
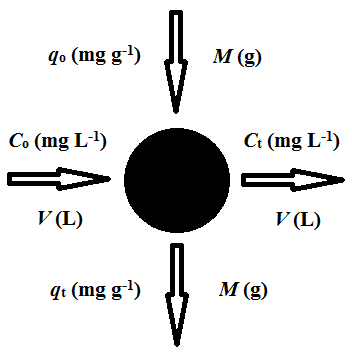


Fig. 3. Effect of synthetic dye concentration.

A



B

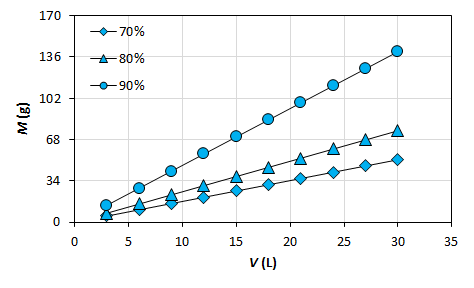
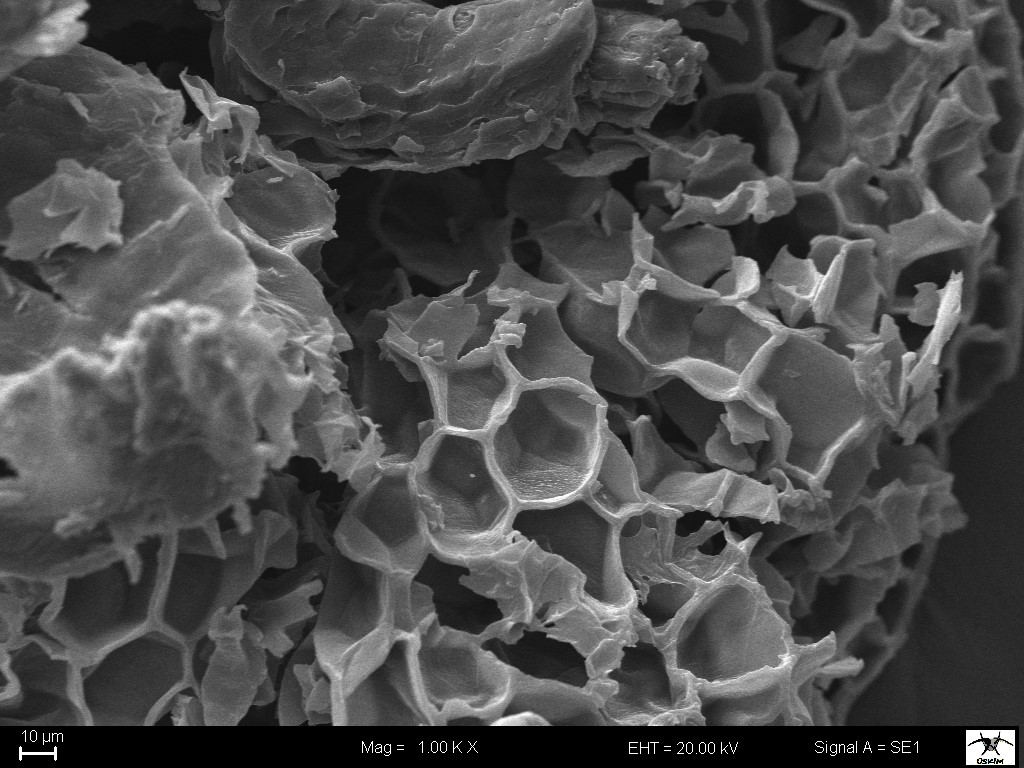


Fig. 5. Schematic plan of single-stage batch bioreactor system (a) and predicted required biosorbent amount for desired % biosorption yield (b).

A



B

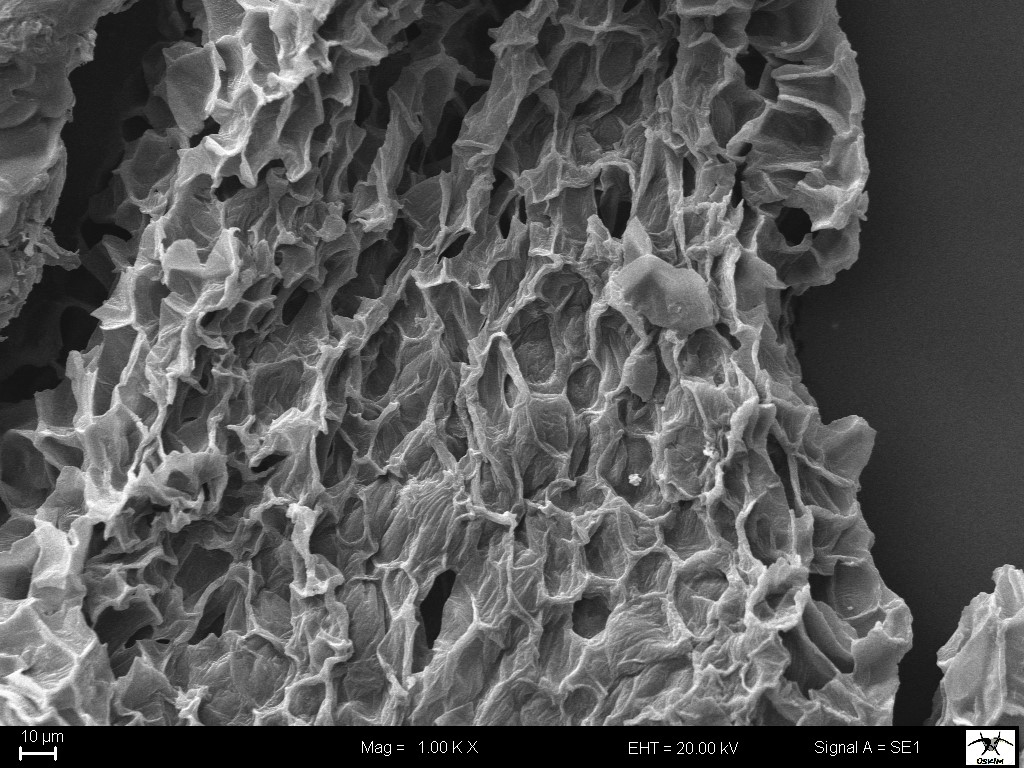
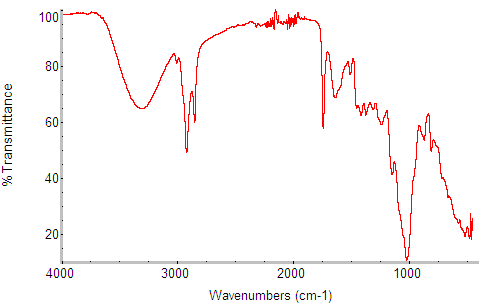


Fig. 8. SEM image of biosorbent before (a) and after dye biosorption (b).

A



B

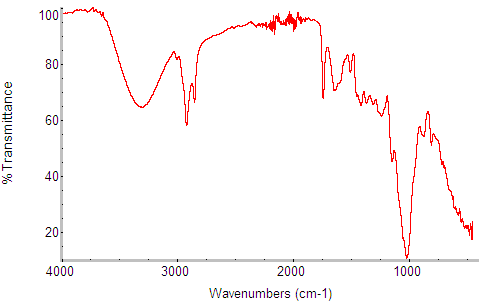


Fig. 9. FTIR spectrum of biosorbent before (a) and after dye biosorption (b).

Table 1. Operational variables and levels studied.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Symbol | Level | | |
|  |  | 1 | 2 | 3 |
| Contact time (min) | *t* | 60 | 180 | 360 |
| pH | pH | 4 | 6 | 8 |
| Synthetic dye concentration (mg L-1) | *C* | 10 | 20 | 30 |

Table 2. Taguchi *L*9 orthogonal array experimental design matrix.

|  |  |  |  |
| --- | --- | --- | --- |
| Test run | Operational parameters | | |
|  | *t* (min) | pH | *C* (mg L-1) |
| 1 | 60 | 4 | 10 |
| 2 | 60 | 6 | 20 |
| 3 | 60 | 8 | 30 |
| 4 | 180 | 4 | 20 |
| 5 | 180 | 6 | 30 |
| 6 | 180 | 8 | 10 |
| 7 | 360 | 4 | 30 |
| 8 | 360 | 6 | 10 |
| 9 | 360 | 8 | 20 |

Table 4. Experimental and predicted *S/N* ratios based on Taguchi *L*9 orthogonal array approach.

|  |  |  |
| --- | --- | --- |
| Test run | *S/N* ratio | |
|  | Experimental | Predicted |
| 1 | 19.5127 | 19.9483 |
| 2 | 32.8201 | 32.8518 |
| 3 | 33.9156 | 33.4483 |
| 4 | 29.3922 | 28.9248 |
| 5 | 37.1980 | 37.6336 |
| 6 | 29.4969 | 29.5287 |
| 7 | 32.4297 | 32.4615 |
| 8 | 32.9364 | 32.4690 |
| 9 | 36.8246 | 37.2602 |

Table 6. System performance parameters.

|  |  |  |
| --- | --- | --- |
| Parameter |  | Value |
| *R*i (min-1) |  | 0.0241 |
| *t*1/2 (min) |  | 41.41 |
| *t*x (min) | *X* |  |
| *t*0.55 | 0.55 | 50.61 |
| *t*0.65 | 0.65 | 76.90 |
| *t*0.75 | 0.75 | 124.23 |
| *t*0.85 | 0.85 | 234.65 |
| *t*0.95 | 0.95 | 786.78 |
| *t*0.97 | 0.97 | 1338.90 |