

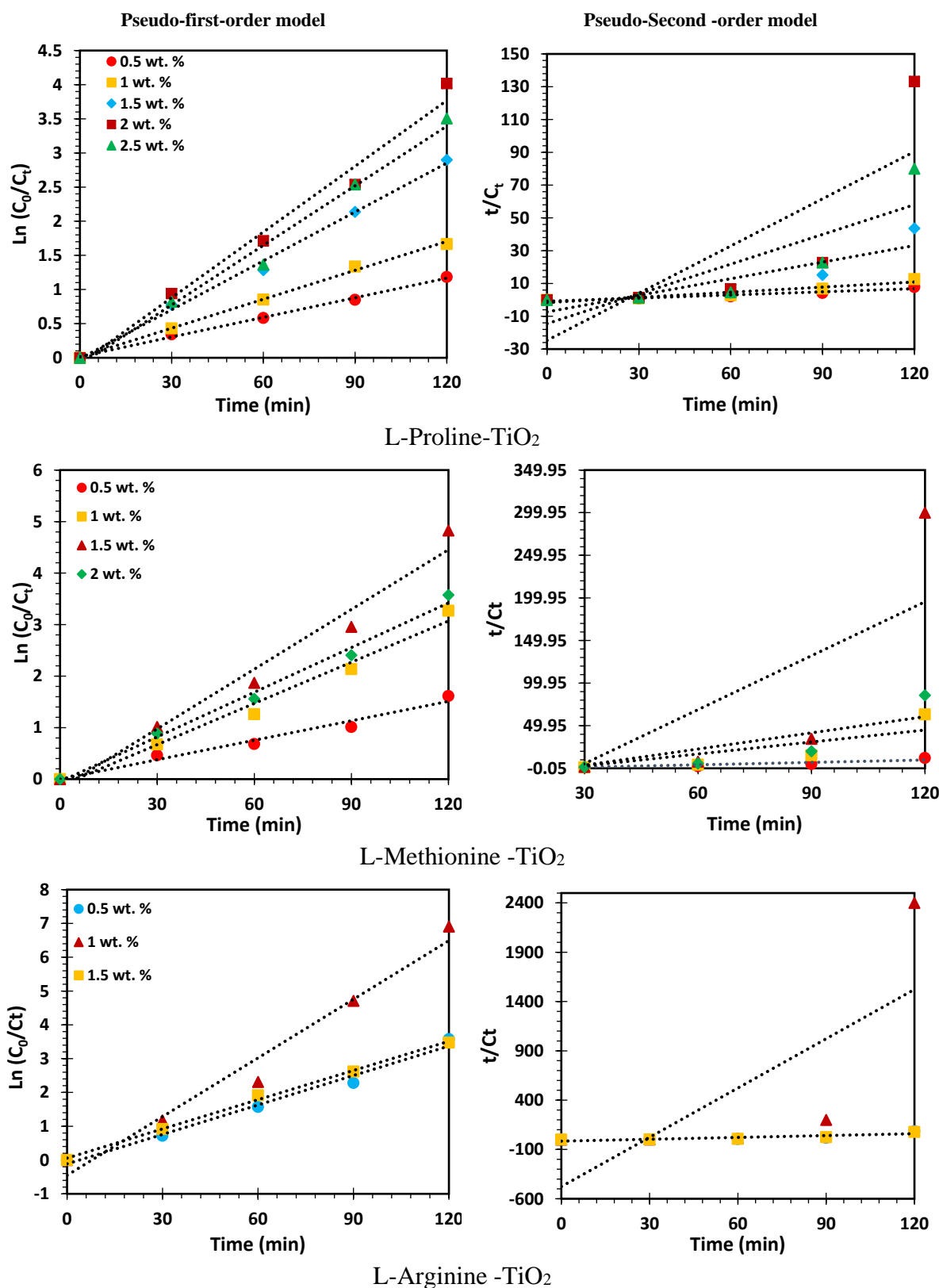
**Figure S1.** Calibration curve (a) MNZ, (b) CEX.

**Table S1.** Experimental conditions and response data for drug photocatalytic removal.

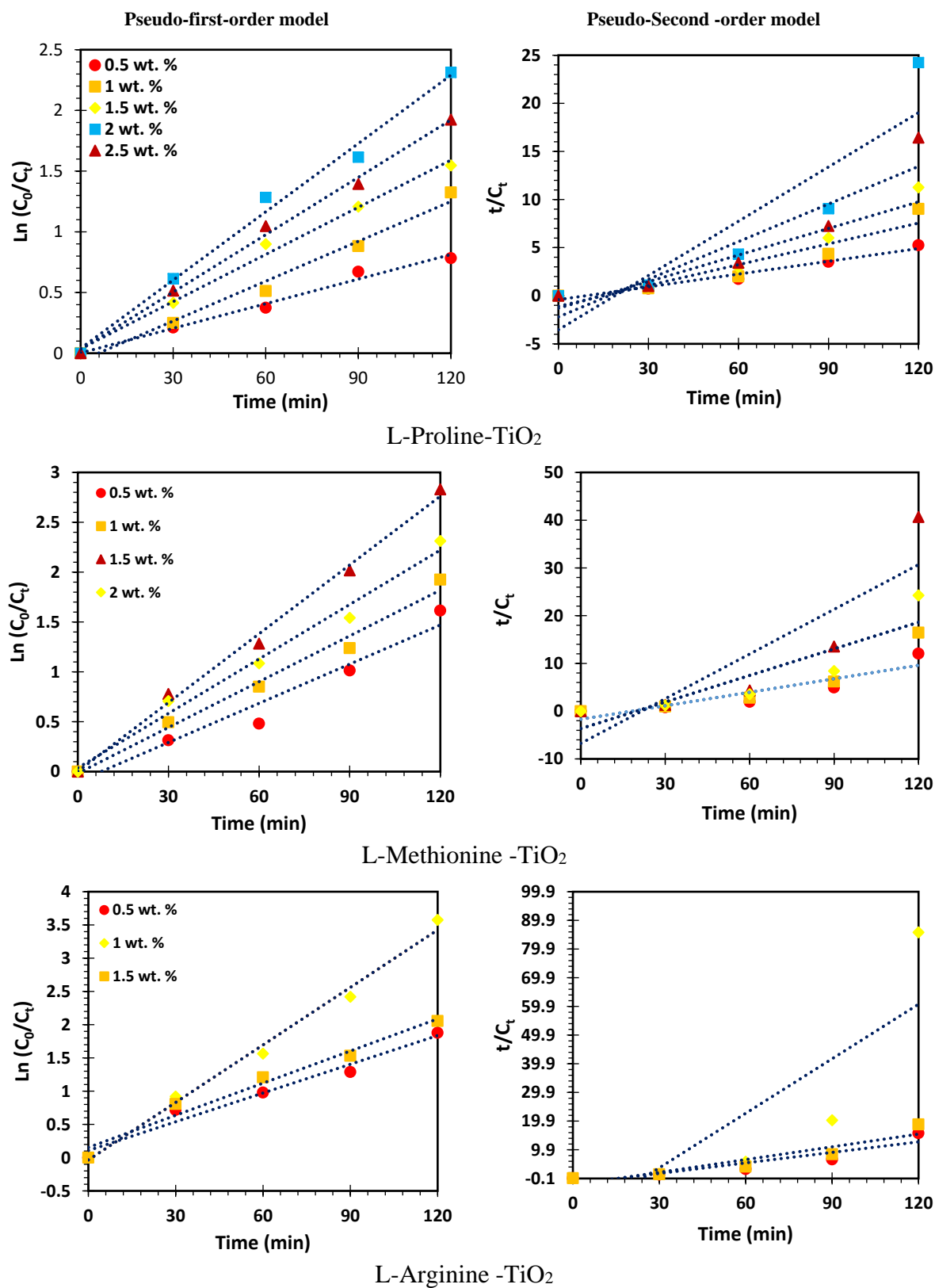
| Run no. | A   | B   | C  | D   | E          | Drug removal (%) |
|---------|-----|-----|----|-----|------------|------------------|
| 1       | 50  | 0.5 | 4  | 1   | Cephalexin | 64.2             |
| 2       | 50  | 0.5 | 4  | 2   | Cephalexin | 73.2             |
| 3       | 50  | 0.5 | 10 | 1   | Cephalexin | 45.1             |
| 4       | 50  | 0.5 | 10 | 2   | Cephalexin | 59.7             |
| 5       | 50  | 1   | 7  | 1.5 | Cephalexin | 86.4             |
| 6       | 50  | 1.5 | 4  | 1   | Cephalexin | 78.2             |
| 7       | 50  | 1.5 | 4  | 2   | Cephalexin | 97.2             |
| 8       | 50  | 1.5 | 10 | 1   | Cephalexin | 57.4             |
| 9       | 50  | 1.5 | 10 | 2   | Cephalexin | 66.7             |
| 10      | 75  | 0.5 | 7  | 1.5 | Cephalexin | 51.2             |
| 11      | 75  | 1   | 7  | 1   | Cephalexin | 62.7             |
| 12      | 75  | 1   | 7  | 1.5 | Cephalexin | 70.1             |
| 13      | 75  | 1   | 7  | 1.5 | Cephalexin | 78.2             |
| 14      | 75  | 1   | 7  | 1.5 | Cephalexin | 68.4             |
| 15      | 75  | 1   | 7  | 1.5 | Cephalexin | 74.5             |
| 16      | 75  | 1   | 7  | 1.5 | Cephalexin | 72.9             |
| 17      | 75  | 1   | 7  | 1.5 | Cephalexin | 75.8             |
| 18      | 75  | 1.5 | 7  | 1.5 | Cephalexin | 69.4             |
| 19      | 75  | 1   | 4  | 1.5 | Cephalexin | 64.2             |
| 20      | 75  | 1   | 7  | 2   | Cephalexin | 77.4             |
| 21      | 75  | 1   | 10 | 1.5 | Cephalexin | 54.5             |
| 22      | 100 | 0.5 | 10 | 1   | Cephalexin | 18.1             |
| 23      | 100 | 0.5 | 10 | 2   | Cephalexin | 32.7             |
| 24      | 100 | 0.5 | 4  | 1   | Cephalexin | 37.2             |
| 25      | 100 | 0.5 | 4  | 2   | Cephalexin | 46.2             |

|    |     |     |    |     |               |      |
|----|-----|-----|----|-----|---------------|------|
| 26 | 100 | 1   | 7  | 1.5 | Cephalexin    | 51   |
| 27 | 100 | 1.5 | 4  | 1   | Cephalexin    | 61.3 |
| 28 | 100 | 1.5 | 4  | 2   | Cephalexin    | 75.3 |
| 29 | 100 | 1.5 | 10 | 1   | Cephalexin    | 30.4 |
| 30 | 100 | 1.5 | 10 | 2   | Cephalexin    | 39.7 |
| 31 | 50  | 0.5 | 4  | 1   | Metronidazole | 78.2 |
| 32 | 50  | 0.5 | 4  | 2   | Metronidazole | 84.3 |
| 33 | 50  | 0.5 | 10 | 1   | Metronidazole | 52.4 |
| 34 | 50  | 0.5 | 10 | 2   | Metronidazole | 62.9 |
| 35 | 50  | 1   | 7  | 1.5 | Metronidazole | 99.9 |
| 36 | 50  | 1.5 | 4  | 1   | Metronidazole | 90.1 |
| 37 | 50  | 1.5 | 4  | 2   | Metronidazole | 99.9 |
| 38 | 50  | 1.5 | 10 | 1   | Metronidazole | 68.7 |
| 39 | 50  | 1.5 | 10 | 2   | Metronidazole | 77.9 |
| 40 | 75  | 0.5 | 7  | 1.5 | Metronidazole | 64   |
| 41 | 75  | 1   | 4  | 1.5 | Metronidazole | 87.4 |
| 42 | 75  | 1   | 7  | 1.5 | Metronidazole | 79.3 |
| 43 | 75  | 1   | 7  | 2   | Metronidazole | 85.4 |
| 44 | 75  | 1   | 7  | 1.5 | Metronidazole | 73.2 |
| 45 | 75  | 1   | 7  | 1.5 | Metronidazole | 76.7 |
| 46 | 75  | 1   | 7  | 1.5 | Metronidazole | 82.7 |
| 47 | 75  | 1   | 7  | 1.5 | Metronidazole | 71.1 |
| 48 | 75  | 1   | 7  | 1.5 | Metronidazole | 78.4 |
| 49 | 75  | 1   | 7  | 1   | Metronidazole | 68.4 |
| 50 | 75  | 1   | 10 | 1.5 | Metronidazole | 67   |
| 51 | 75  | 1.5 | 7  | 1.5 | Metronidazole | 74   |
| 52 | 100 | 0.5 | 4  | 1   | Metronidazole | 48.2 |
| 53 | 100 | 0.5 | 4  | 2   | Metronidazole | 54.3 |
| 54 | 100 | 0.5 | 10 | 1   | Metronidazole | 22.4 |
| 55 | 100 | 0.5 | 10 | 2   | Metronidazole | 32.9 |
| 56 | 100 | 1   | 7  | 1.5 | Metronidazole | 69.9 |
| 57 | 100 | 1.5 | 4  | 1   | Metronidazole | 60.1 |
| 58 | 100 | 1.5 | 4  | 2   | Metronidazole | 69.9 |
| 59 | 100 | 1.5 | 10 | 1   | Metronidazole | 38.7 |
| 60 | 100 | 1.5 | 10 | 2   | Metronidazole | 47.9 |

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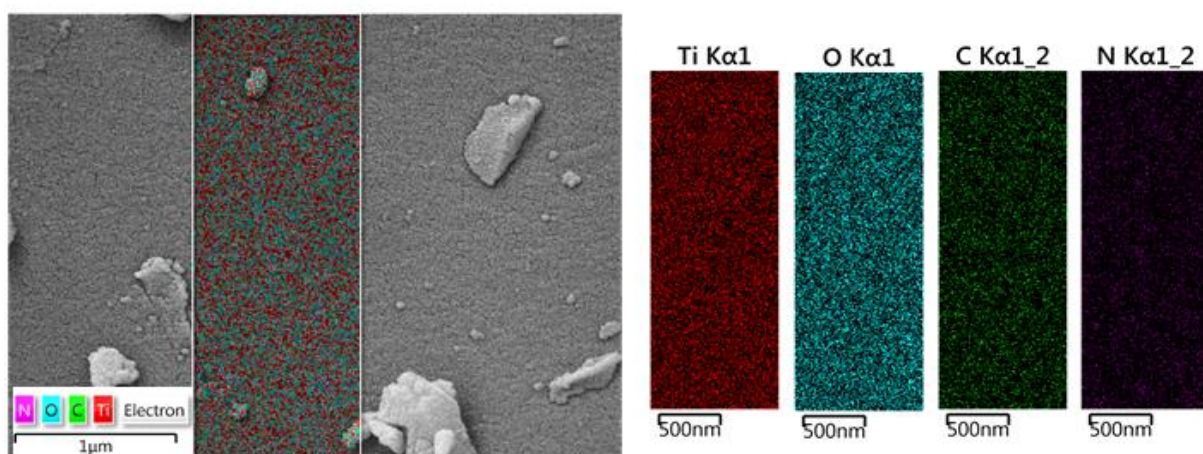
**Figure S2.** Kinetic models of MNZ photocatalytic removal for L-Amino acid-TiO<sub>2</sub> at catalyst loading of 1 g/L, MNZ concentration of 50 mg/L and pH of 4.



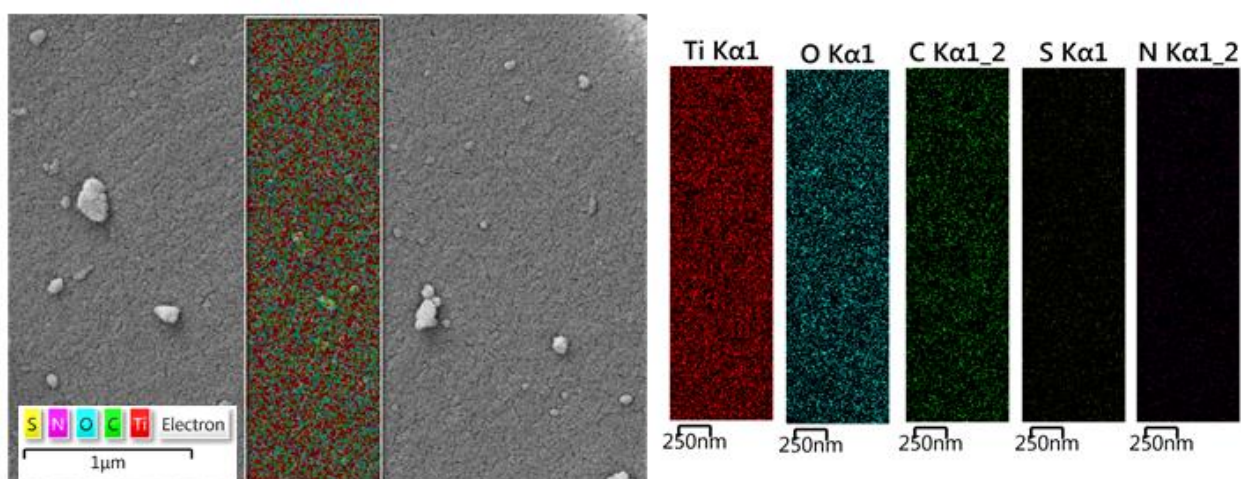
**Figure S3.** Kinetic models of CEX photocatalytic removal for L-Amino acid-TiO<sub>2</sub> at catalyst loading of 1 g/L, CEX concentration of 50 mg/L and pH of 4.

**Table S2.** The particle size distribution of the prepared samples.

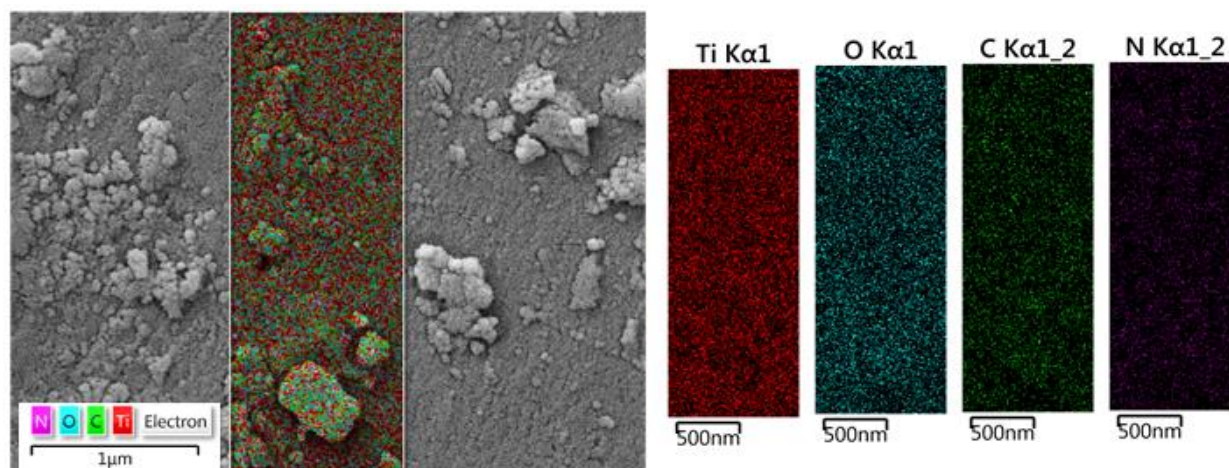
|                           | <b>L-Proline (2 wt. %)-TiO<sub>2</sub></b> |                       | <b>L-Methionine (1.5 wt. %)-TiO<sub>2</sub></b> |                       | <b>L-Arginine (1 wt. %)-TiO<sub>2</sub></b> |                       |
|---------------------------|--|-----------------------|---|-----------------------|---|-----------------------|
| <b>Particle size (nm)</b> | Number of particles                        | Size distribution (%) | Number of particles                             | Size distribution (%) | Number of particles                         | Size distribution (%) |
| <b>0-10</b>               | 4  | 1.30                  | 7   | 2.24                  | 7   | 1.89                  |
| <b>10-20</b>              | 21   | 6.80                  | 54  | 17.25                 | 135   | 36.58                 |
| <b>20-30</b>              | 64   | 20.60                 | 123   | 39.29                 | 91  | 24.66                 |
| <b>30-40</b>              | 111  | 35.80                 | 79  | 25.2                  | 73  | 19.78                 |
| <b>40-50</b>              | 56   | 18.10                 | 23  | 7.35                  | 34  | 9.21                  |
| <b>50-60</b>              | 34   | 10.90                 | 4   | 1.28                  | 8   | 2.22                  |
| <b>60-70</b>              | 7  | 2.25                  | 3   | 0.96                  | 10  | 2.71                  |
| <b>70-80</b>              | 7  | 2.25                  | 7   | 2.23                  | 3   | 0.81                  |
| <b>80-90</b>              | 3  | 0.97                  | 10  | 3.2                   | 4   | 1.07                  |
| <b>90-100</b>             | 3  | 0.97                  | 3   | 0.96                  | 4   | 1.07                  |



**L-Proline-TiO<sub>2</sub>**

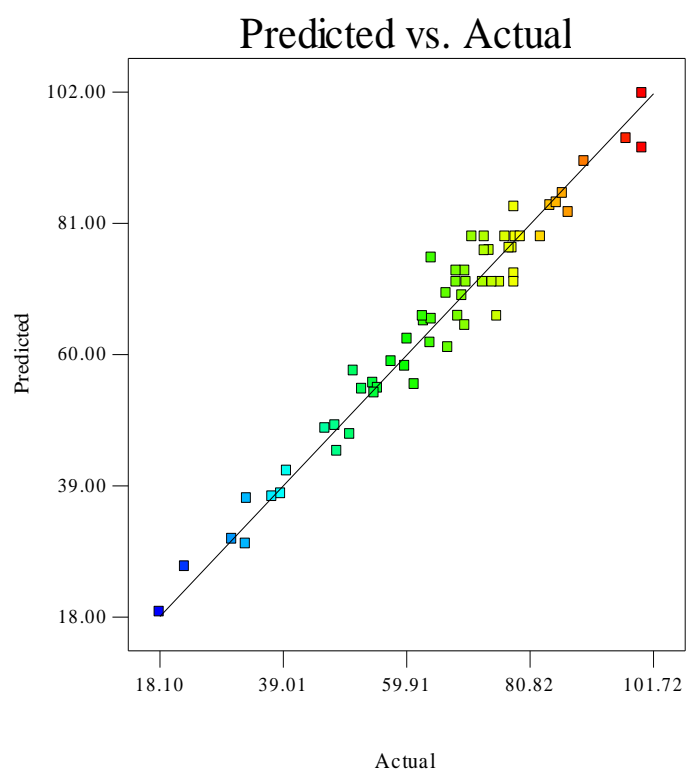


**L-Methionine-TiO<sub>2</sub>**

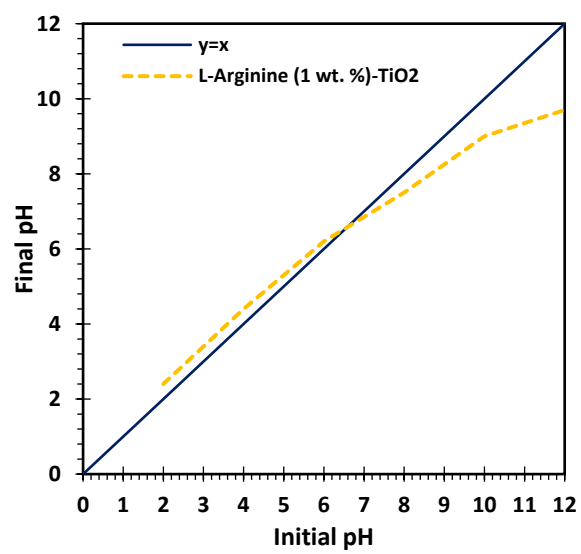


**L-Arginine-TiO<sub>2</sub>**

**Figure S4.** Elemental mapping of the prepared nano-photocatalysts.



**Figure S5.** Predicted vs. actual values plot for antibiotics photodegradation process.



**Figure S6.** Measurement of the zero charge point for L-Arginine-TiO<sub>2</sub> photocatalysts.