**Electro-assisted ammonium persulfate activation to promote the introduction of N and S into TiO2 film: enhancing** **its photoelectrocatalytic performance under solar**

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**FIG. S1** (a) TEM image of the NOx/S6+-TiO2 film, (b) partial enlarged view of (a), and (c) its high-resolution region of crystalline material.



**FIG. S2** Photoluminescence (PL) spectra of the NOx/S6+-TiO2 film with excitation wavelength at 380 nm.

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**FIG. S3** The kinetic curves of methyl orange using the NOx/S6+-TiO2 film.

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| --- | --- | --- | --- | --- | --- |
| Simulated pollutants | co (mg/L) | Methods | Reaction conditions | color removal % | Ref. |
| Methyl orange | 20 | Anodizing, electrolyte: 0.07 mg/mL graphene + 100 mg/L Mg(NO3)2·6H2O | 40 mL, 0.5 M NaCl, sunlight (90080 lx) for 2 h, 2 V | 97.00/ | [[1](#_ENREF_1)] |
| Methylene blue | 10 | Sol-gel and coating, electrolyte: -  | 50 mL, 0.05 M Na2SO4, 450 W metal halide lamp (λ > 420 nm) for 4 h, 1.4 V | 92.9 | [[2](#_ENREF_2)] |
| Methyl orange | 10 | Anodizing, electrolyte: 0.1M H3PO3 + 0.2M NH4F | 50 mL , 0.2 M Na2S, 300 W Xe for 3 h, 0.5 V  | 89 | [[3](#_ENREF_3)] |
| Rhodamine B | 5 | Two-step oxidation in 5 wt% oxalic acid and 0.15 wt% TiCl3 solution respectively | 20 mL, 0.1 M H3PO3, 500 W Xe for 2 h, 0.8 V | 53 | [[4](#_ENREF_4)] |
| Methyl orange | 20 | Anodizing, electrolyte:1.5 wt% HNO3 and 1.0 wt% H2O+EG  | 40 mL , 0.5 M NaCl, sunlight (90830 lx) for 150 min, 2 V | 95.00 | [[5](#_ENREF_5)] |
| Methylene blue | 20 | -- | 40 mL ,0.01 M Na2SO4, 350W Xe (200-1200nm) for 240 min, 2 V | 60 | [[6](#_ENREF_6)] |
| Methyl orange | 20 | anodisation. electrolyte: 1/12M C2H2O4·2H2O + 0.5 wt% NH4F  | 500 mL, 0.1 M Na2SO4, 300 W Xe for 2 h, 2.0 V | 92 | [[7](#_ENREF_7)] |
| Methyl orange | 20 | anodisation and magnetron sputtering. 90 vol% ethylene glycol + 0.6 wt% [EPy][BF4] + 10 vol% H2O | 40 mL, 0.5 M NaCl, 150 W Xe for 15 min, 2.0 V | 100 | [[8](#_ENREF_8)] |
| Methylene blue | 5 | -- | 50 mL, 500 W Xe with a 420 nm cut-off filter for 60 min  | 83% | [[9](#_ENREF_9)] |
| Methylene blue | 3.739 | Dip-coating method with preheating and post-heating treatments: - |  6.5 mL, UV lamp with 365 nm 60 uW/cm2 about 40 min | 100 | [[10](#_ENREF_10)] |

**TABLE SI** Percent of color removals for selected PEC treatments of several representative dye wastewaters using different photoanodes.

“-” : Using different solutions for each step, “--” : Complicated operation with many steps

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