

Facile Synthesis of Various ZrO_2 Phases and $\text{ZrO}_2\text{-MO}_2$ ($\text{M}=\text{Ti}, \text{Hf}$) by Thermal Decomposition of a Single UiO-66 Precursor for Photodegradation of Methyl Orange

Ira Nur Arba'atul Jannah ¹, Hanu Fiorena Sekarsari ¹, Sri Mulijani ², Karna Wijaya ³, Arief Cahyo Wibowo ^{4,*,\dagger} and Aep Patah ^{1,*}

¹ Division of Inorganic and Physical Chemistry, Faculty of Mathematics and Natural Sciences, Institut Teknologi Bandung, Jl. Ganesha 10, Bandung 40132, Indonesia; iranurarbaatuljannah@gmail.com (I.N.A.J.); hanufiorena@gmail.com (H.F.S.)

² Department of Chemistry, Faculty of Mathematics and Natural Sciences, Institut Pertanian Bogor, Tanjung Campus of IPB Dramaga, Bogor 16680, Indonesia; srimulijani@apps.ipb.ac.id

³ Department of Chemistry, Faculty of Mathematics and Natural Sciences, Gadjah Mada University, Bulaksumur Bls. 21, Sekip Utara, Yogyakarta 55281, Indonesia; karnawijaya@ugm.ac.id

⁴ School of Advanced Technology and Multidiscipline, Universitas Airlangga, Campus C Mulyorejo, Surabaya 60115, Indonesia

* Correspondence: arief.wibowo@adu.ac.ae (A.C.W.); aep@itb.ac.id (A.P.)

\dagger Present address: Department of Applied Sciences, College of Arts and Sciences, Abu Dhabi University, Abu Dhabi, 59911, United Arab Emirates.

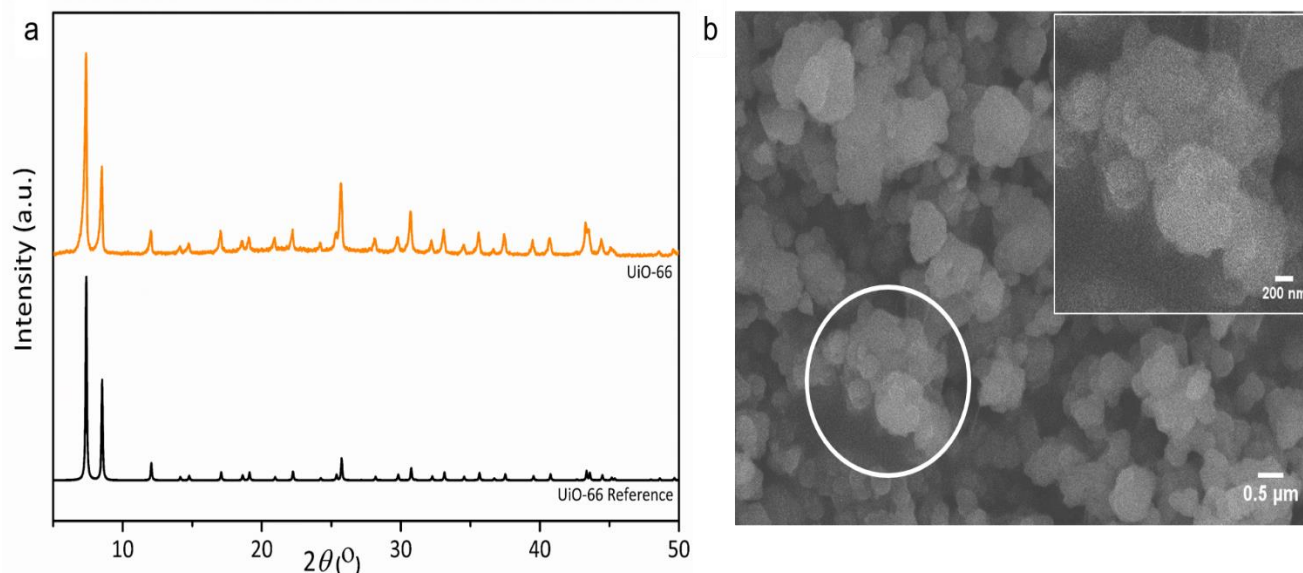


Figure S1. PXRD pattern (a) and SEM images (b) of UiO-66

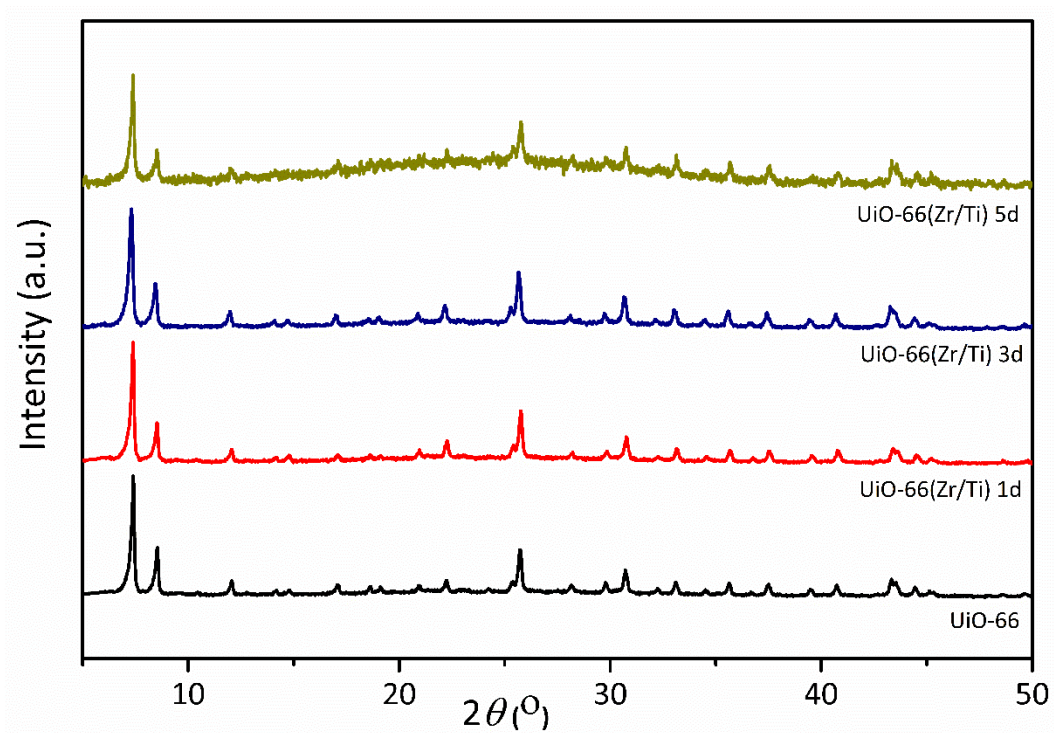


Figure S2. PXRD patterns of UiO-66(Zr/Ti) 1, 3, and 5d

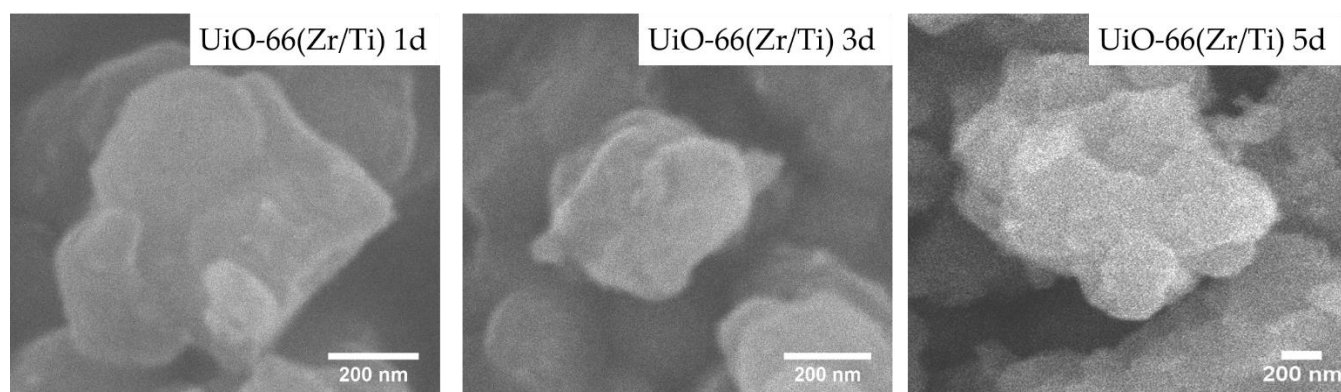


Figure S3. SEM images of UiO-66(Zr/Ti) 1, 3, and 5d

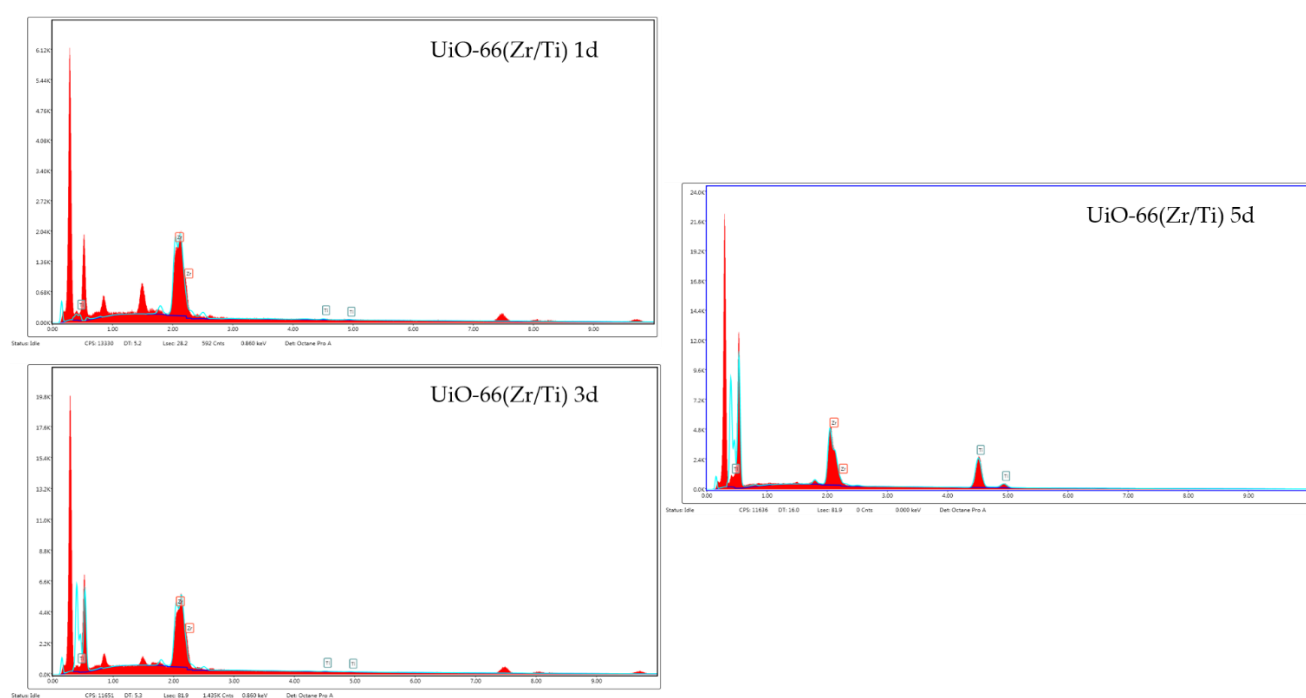
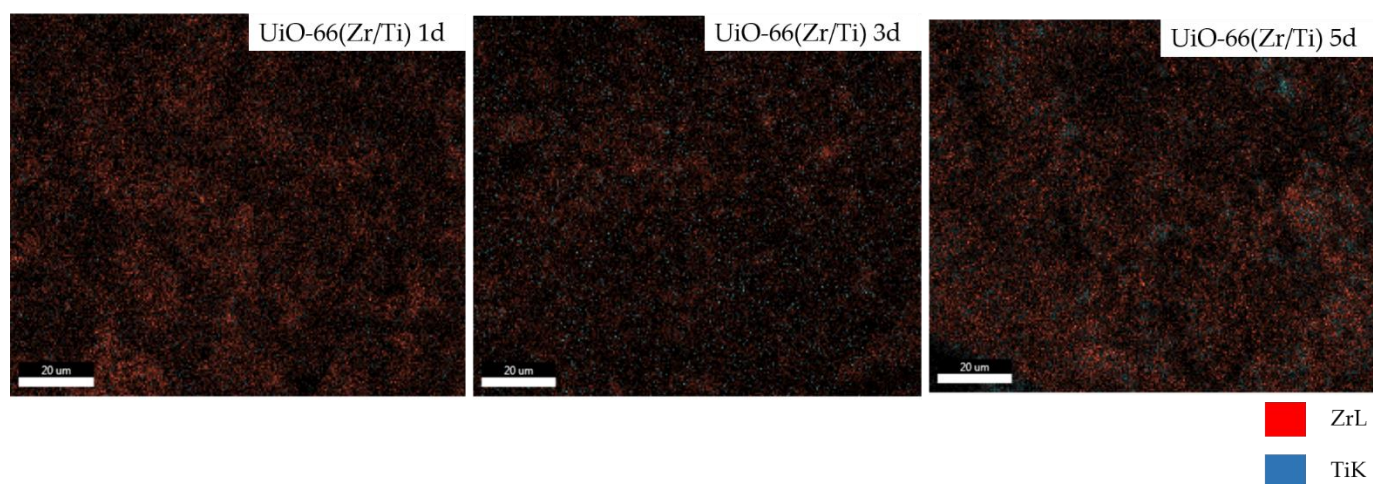


Figure S4. Elemental mapping and EDS spectrum of UiO-66(Zr/Ti) 1, 3, and 5d

Table S1. SEM-EDS analysis of % atomic of UiO-66(Zr/Ti)

| Sample | % atomic | | | |
|------------------|----------|-------|------|------|
| | C | O | Zr | Ti |
| UiO-66(Zr/Ti)-1d | 74.20 | 23.07 | 2.62 | 0.11 |
| UiO-66(Zr/Ti)-3d | 74.05 | 23.47 | 2.37 | 0.11 |
| UiO-66(Zr/Ti)-5d | 64.64 | 30.03 | 1.86 | 3.47 |

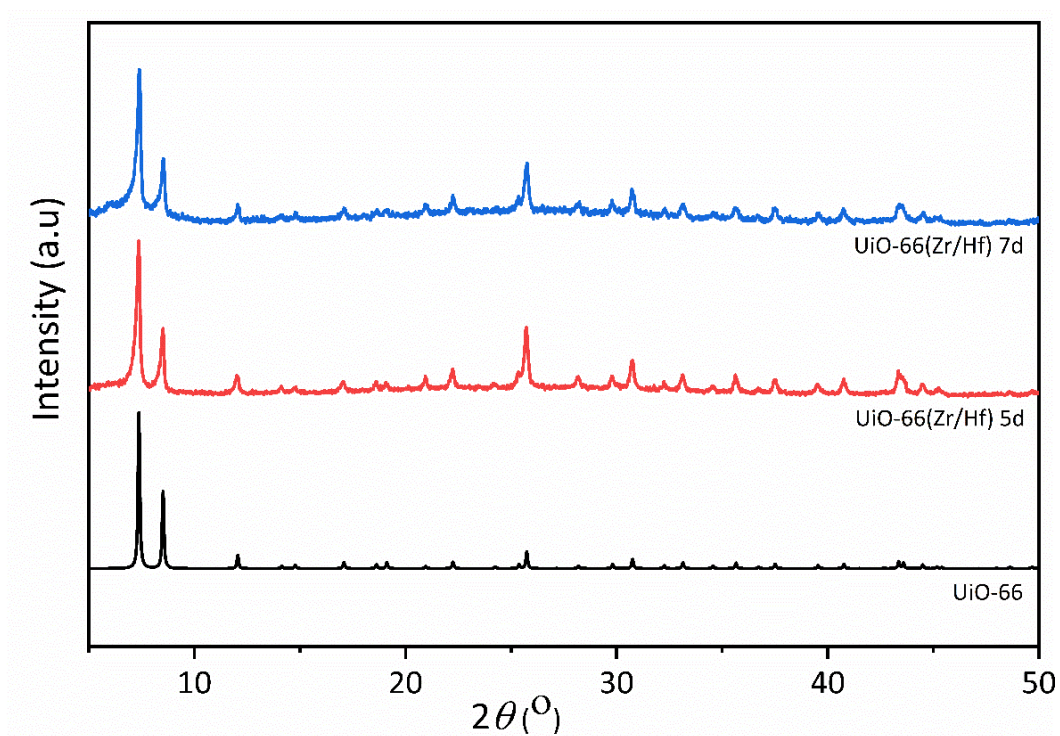


Figure S5. PXRD patterns of UiO-66 (Zr/Hf) 5 and 7d

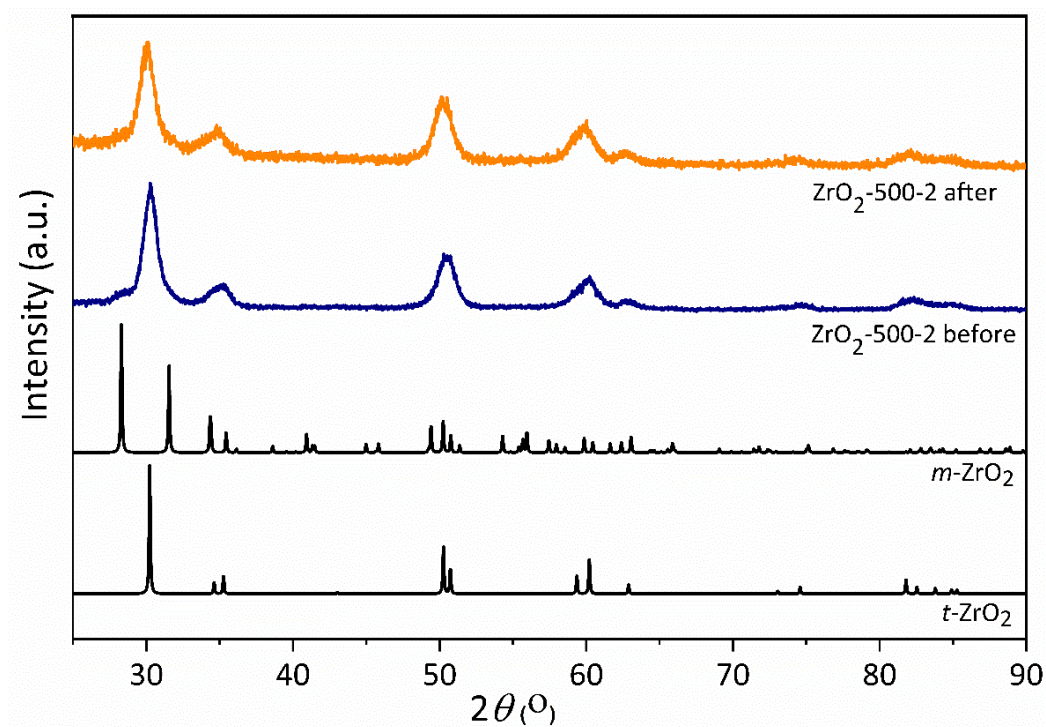


Figure S6. PXRD patterns of *t*-ZrO₂ before and after successive catalytic cycle