

Supplementary Information

Iridium-based nanocomposite prepared from an iridium complex with a hydrocarbon-based ligand

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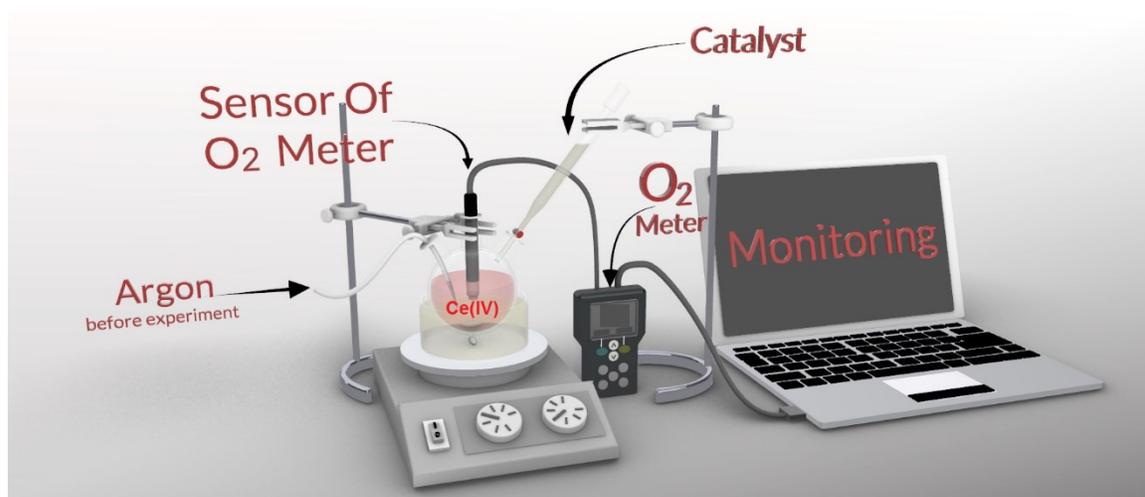
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Oxygen-evolution reaction in the presence of cerium(IV) ammonium nitrate

Oxygen-evolution experiments in the presence of cerium(IV) ammonium nitrate ($(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$, CAN) were performed using an HQ40d portable dissolved oxygen-meter connected to an oxygen monitor with a digital readout at 25 °C. In a typical run, the instrument readout was calibrated against air-saturated distilled water stirred continuously with a magnetic stirrer in an air-tight reactor. After ensuring a constant baseline reading, water in the reactor was replaced with CAN solution. Without the catalyst, CAN was stable under these conditions and oxygen evolution was not observed. After deaeration of CAN with argon, **complex 1** was added, and oxygen evolution was recorded under stirring (Scheme S1). The formation of oxygen was followed and the oxygen formation rates per Ir site were obtained from linear fits of the data by the initial rate.



Scheme S1 Set-up for oxygen-evolution experiments in the presence of CAN.

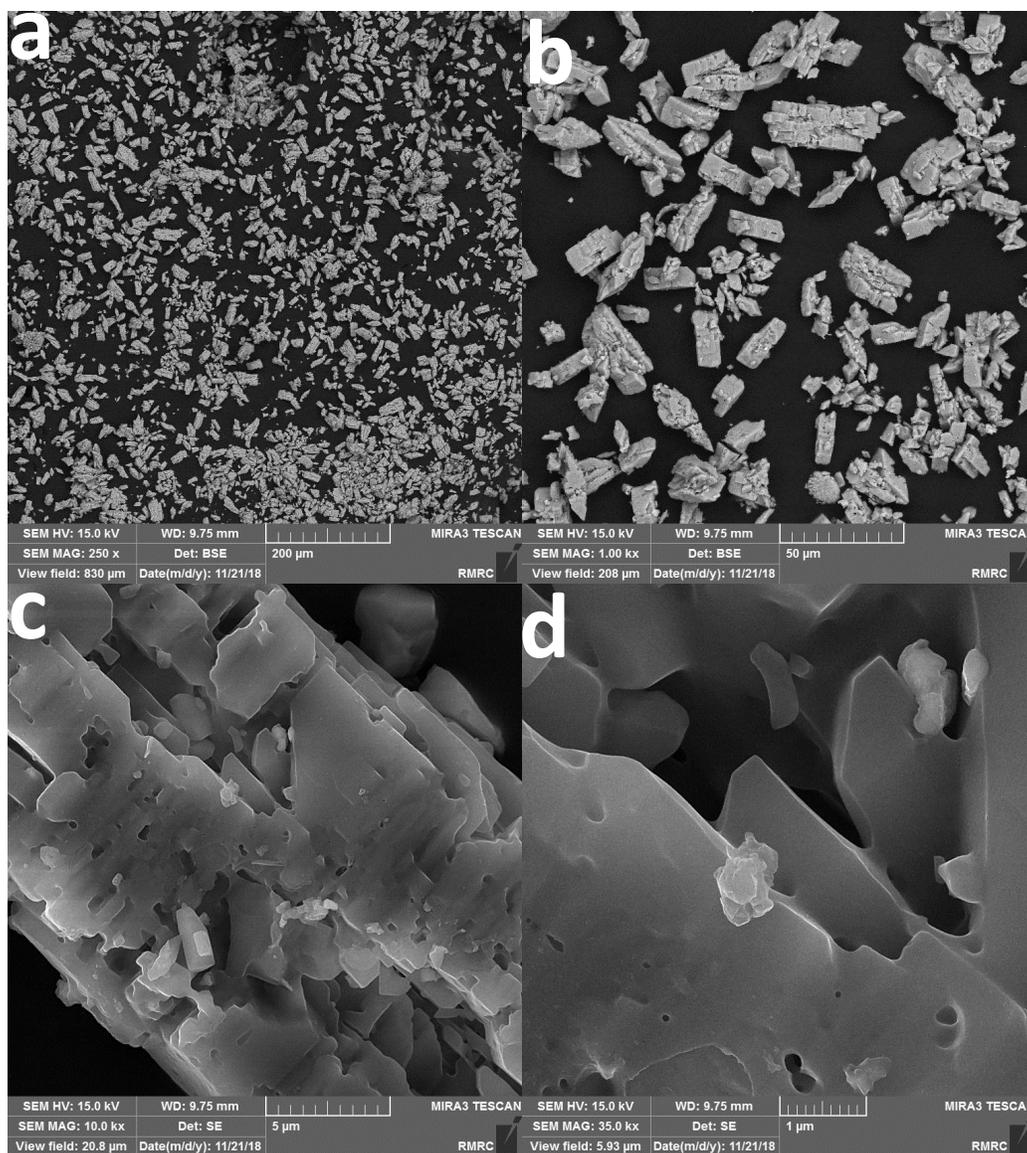


Figure S1 SEM images (a-d; at different magnifications) of iridium compound fragments of **complex 1** (20 mg, 22.3 μmol) in the presence of CAN (10.0 mL, 0.10 M) after one hour under stirring. The particles were centrifuged and washed by water before the analysis (green compound).

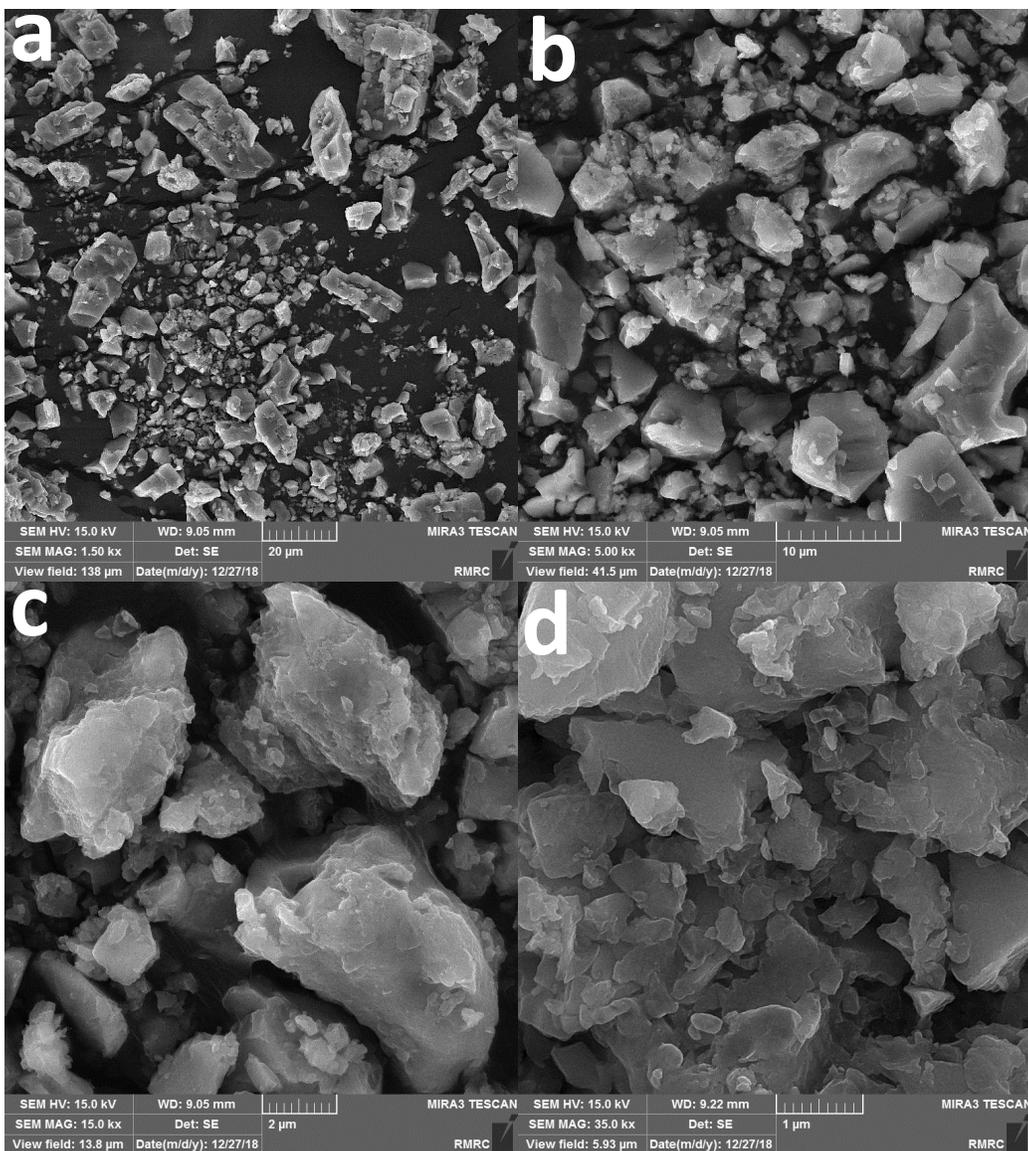


Figure S2 SEM images (a-d; at different magnifications) of iridium compound fragments of **complex 1** (20 mg, 22.3 μmol) in the presence of CAN (10.0 mL, 0.10 M) after four hours under stirring. The iridium compound fragments were centrifuged and washed by water before the analysis (green compound).

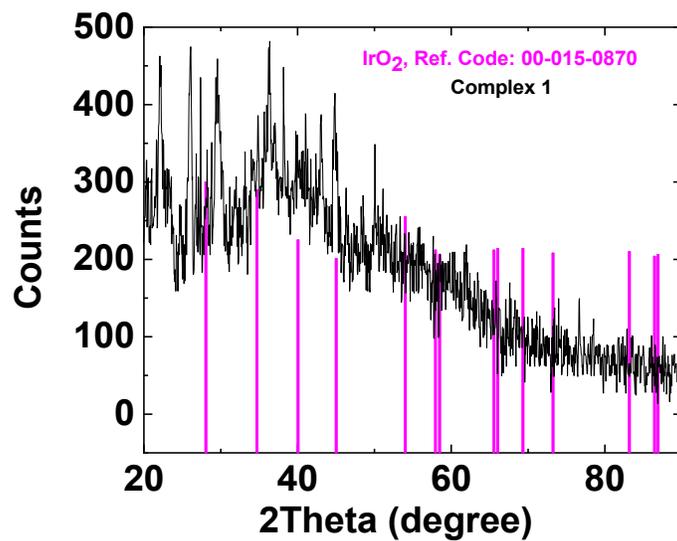


Figure S3 XRD patterns of particles of **complex 1** (20 mg, 22.3 μmol) in the presence of CAN (10.0 mL, 0.10 M) after four hours under stirring. The solid was centrifuged and washed by water before the analysis (green compound).

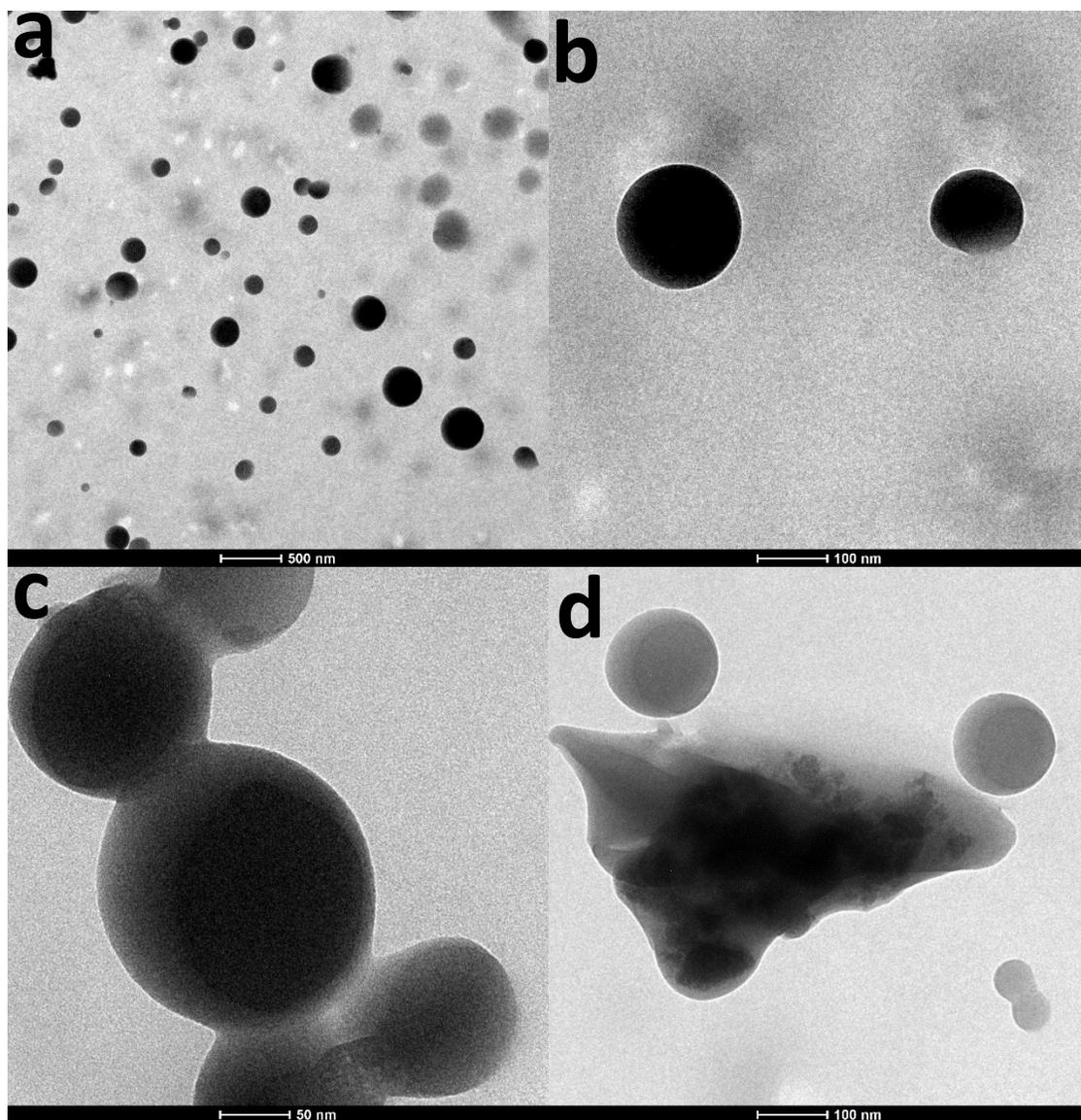


Figure S4 TEM images (a-d; at different magnifications) of particles of **complex 1** (20 mg, 22.3 μmol) in the presence of CAN (10.0 mL, 0.10 M) (green compound) after four hours under stirring. The particles were centrifuged and washed by water before the analysis (green compound).

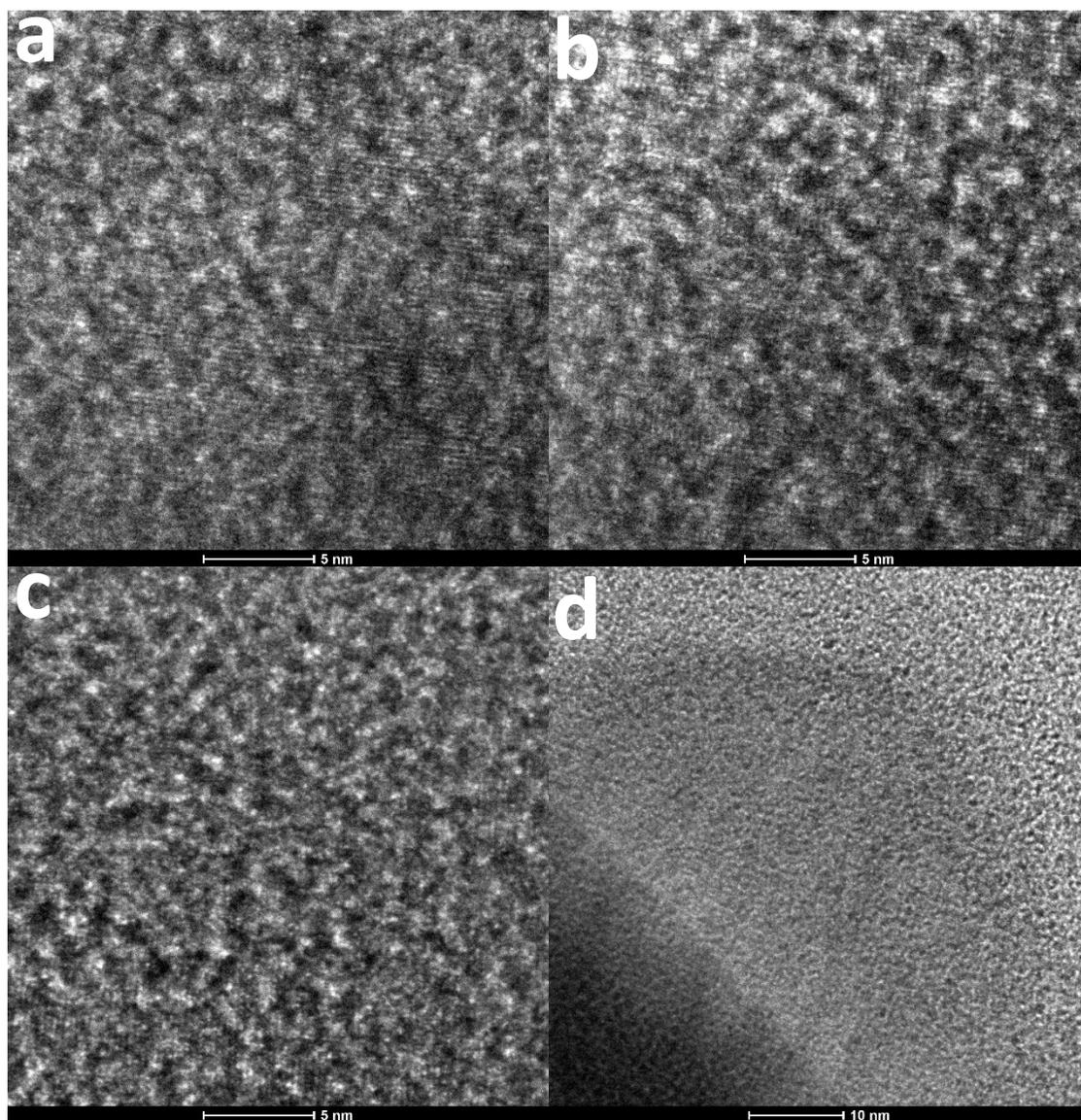


Figure S5 HRTEM images (a-d; at different magnifications) of particles of **complex 1** (20 mg, 22.3 μmol) in the presence of CAN (10.0 mL, 0.10 M) after four hours under stirring (green compound). The particles were centrifuged and washed by water before the analysis.

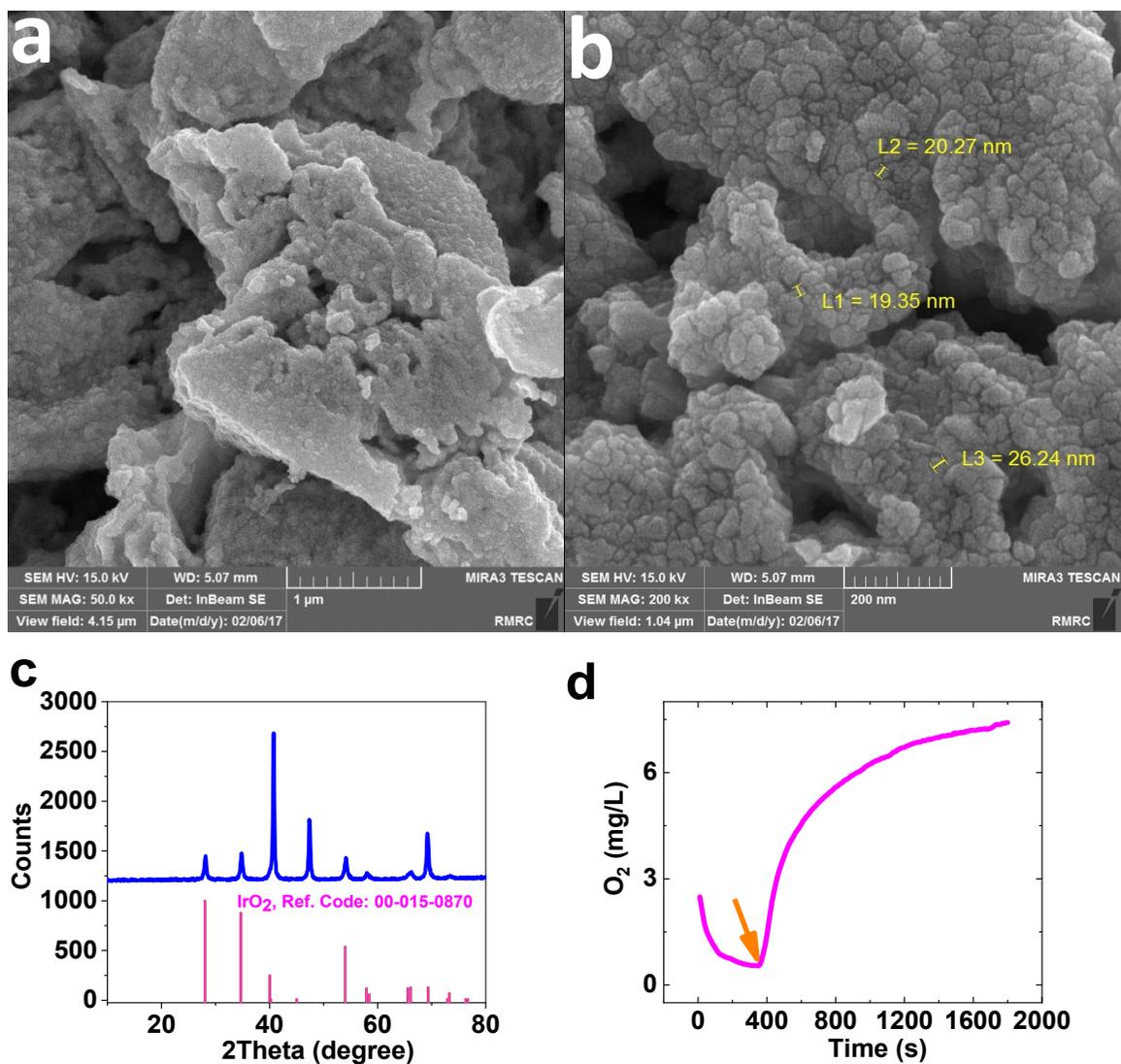
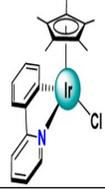
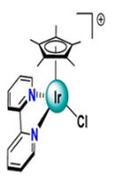
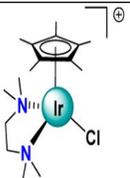
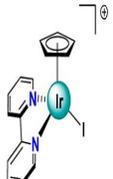
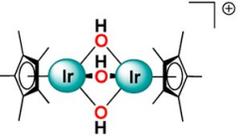
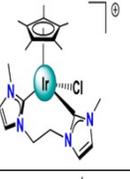
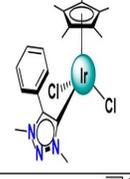
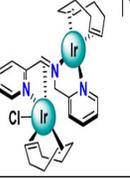


Figure S6 SEM images at different magnifications (a,b), and XRD (c) of the prepared IrO₂ by heating **complex 1**. Oxygen-evolution experiment of IrO₂ (2.0 mg) in the presence of CAN (0.10 M; 40 mL) (d). The orange arrow shows the time of the addition of IrO₂ to CAN.

Table S1 Water oxidation by some Ir compounds.

Compound	TOF (s ⁻¹)	Ref
Complex 1	0.01 ([CAN]: 0.4 M) 0.006 ([CAN]: 0.1 M)	This work
IrO ₂ (15-30 nm)	0.003 ([CAN]: 0.1 M)	This work
	0.0041	1
	0.91	2
	0.24	3
	0.11	3
	0.16	3
	0.17	4
	0.13	5

	1.5	6
	0.10	7
	0.20	7
	0.033	8
	0.94	9
IrO ₂ (1.1 nm)/CNT	11.2	10
IrO ₂ (2.2 nm)/CNT	1.3	10

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