

# Nickel-Iron-Sulfides/ Carbon Nanotube Hybrid Catalyst

Hybrid catalyst exhibits a very high Oxygen Enhancement Ratio (OER) and Oxygen Reduction Reaction (ORR) performance

## Comparison of ORR and OER Performance

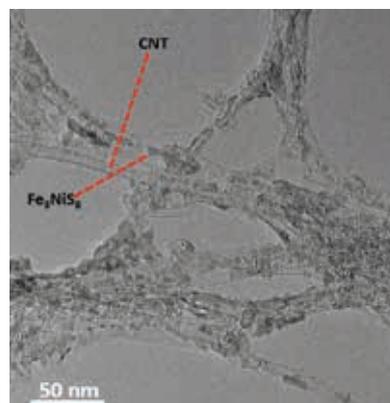
	ORR half wave potential (V vs RHE)	OER potential at 10 mV/cm <sup>2</sup> (V vs RHE)
NiFeS-Single-walled CNT	0.82	1.55
NiFeS-Carbon black	0.77	1.61
NiFeS-Multi-walled CNT	0.74	1.62
NiFeS	0.80	1.80
Pt/C	0.82	NA
IrO <sub>2</sub> /C	NA	1.62

The performance of NiFeS/single-walled CNT hybrid catalyst was higher than those of NiFeS/multi-walled CNT and NiFeS/carbon black catalysts. ORR half-wave and OER potentials at 10 mV were superior to conventional Pt/C and IrO<sub>2</sub>/C.

## Catalyst structure



CG image of hybrid catalyst on single-walled CNT



TEM image of the hybrid catalyst

This work was carried out by collaboration with Kyushu University.