The higher current density with ceria on N-doped carbon for fuel cell

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◎ Introduction

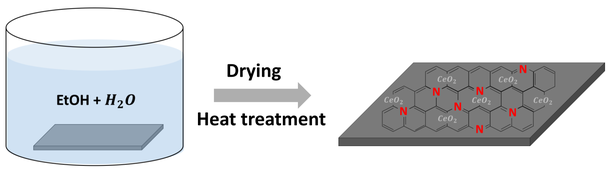
• While **hydrogen fuel cells (PEMFCs)** are highly anticipated for use in the automotive industry as a green energy source, challenges include the durability of polymer electrolyte membranes, and the high cost of platinum catalysts.

• Developing a catalyst that can replace platinum in PEMFCs or increasing the efficiency of the catalytic reaction on the electrode will **reduce the cost of using the catalyst.**

• If other elements can be added to the carbon electrode **to enhance the catalytic reaction and increase the electrical conductivity**, the efficiency of PEMFC will also increase.

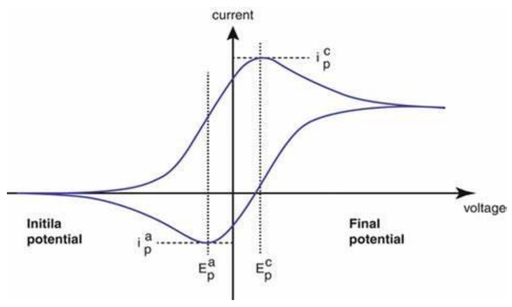
◎ Experimental

<Synthesis procedure>



• Heat treatment of Ce-doped carbon paper made by impregnation method
• Heat treatment of Ce/N-doped carbon paper made by impregnation method

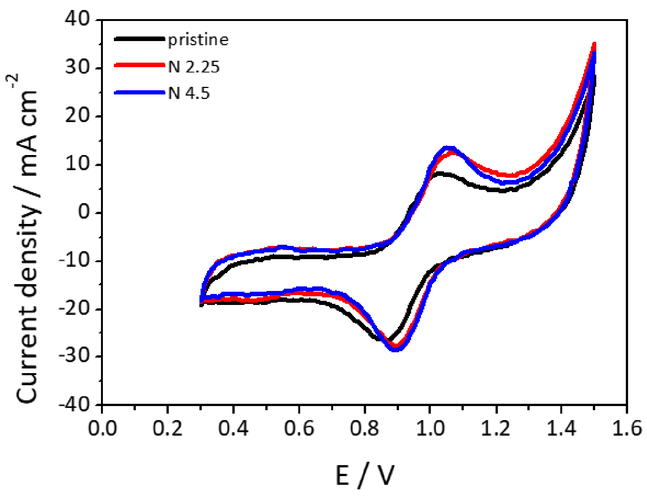
< Analysis >



• Cyclic voltammetry measurement

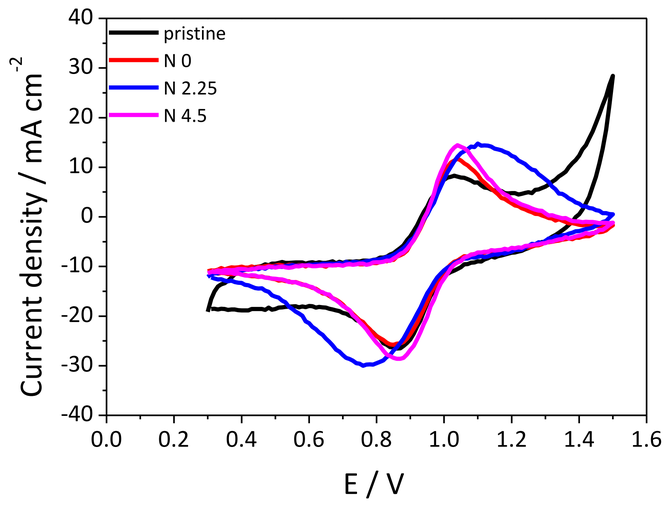
◎ Result

• CV graph according to the Ce change in carbon paper using urea 2.25g



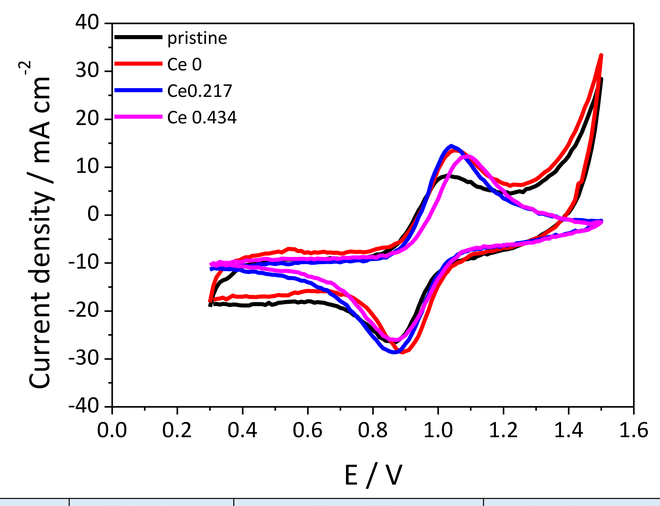
	Prinstine	Urea 2.25g	$Ce(NO_3)_36H2O$ 0.217g Urea 2.25g	$Ce(NO_3)_36H2O$ 0.434g Urea 2.25g
Anodic (mA/cm²)	8.4	10.2	11.4	10.6
Cathodic (mA/cm²)	-10.1	-11.5	-10.9	-8.5
Delta E (V)	0.17	0.17	0.34	0.23

• CV graph according to the N change in carbon paper using $Ce(NO_3)_36H2O$ 0.217g



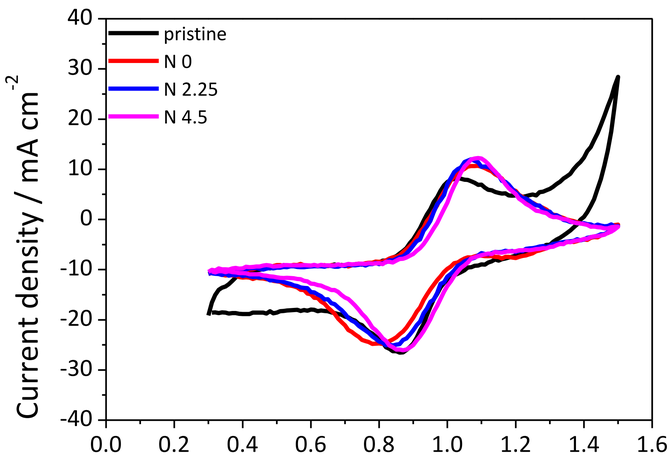
	Prinstine	$Ce(NO_3)_36H2O$ 0.217g	$Ce(NO_3)_36H2O$ 0.217g Urea 2.25g	$Ce(NO_3)_36H2O$ 0.217g Urea 4.5g
Anodic (mA/cm²)	8.4	10.8	11.4	11.9
Cathodic (mA/cm²)	-10.1	-8.9	-10.9	-10.4
Delta E (V)	0.17	0.19	0.34	0.18

• CV graph according to the Ce change in carbon paper using urea 4.5g



	Prinstine	Urea 4.5g	$Ce(NO_3)_36H2O$ 0.217g Urea 4.5g	$Ce(NO_3)_36H2O$ 0.434g Urea 4.5g
Anodic (mA/cm²)	8.4	9.3	11.9	10.6
Cathodic (mA/cm²)	-10.1	-11.8	-10.4	-8.5
Delta E (V)	0.17	0.16	0.18	0.23

• CV graph according to the N change in carbon paper using $Ce(NO_3)_36H2O$ 0.217g



	Prinstine	$Ce(NO_3)_36H2O$ 0.434g	$Ce(NO_3)_36H2O$ 0.434g Urea 2.25g	$Ce(NO_3)_36H2O$ 0.434g Urea 4.5g
Anodic (mA/cm²)	8.4	9.4	10.6	10.6
Cathodic (mA/cm²)	-10.1	-8.6	-8.5	-9.3
Delta E (V)	0.17	0.31	0.23	0.22

◎ Conclusion

1) By doping nitrogen on a carbon electrode with CeO2, it was possible to synthesize an electrode that has a catalytic activation effect and maintains electrical conductivity.
2) Although the electrical conductivity of the N/CeO2-doped electrode increased, it is unknown whether the conductivity of CeO2 changed due to nitrogen.
3) Further analysis is needed to determine whether the electrical properties of CeO2 changed due to nitrogen doping.