

IDA (Interdigitated Array) Electrode

Introducing IDA (Interdigitated Array) electrode developed by NTT Lifestyle and Environmental Technology Laboratory. Several articles about determination of micro-substance and observation of its electrochemical behavior using IDA microelectrode have been reported. This microelectrodes made using lithography technology to form micro pattern upon insulator's plate. Figure1,2 shows the structure of IDA electrode. Number of finger in one electrodes is 65 pairs. Each electrode works as oxidation or reduction electrode.

Advantage:

- High sensitivity CV measurement
- Very small quantity electrochemical measurement
- Small and integrated
- Fast response

Applications:

- Electrode for liquid chromatography
- Electrode for electrochemical analysis
- Biosensor and chemical sensor
- Chemically modified electrode
- Electrode for Chemical reaction process control
- Conductivity measurement

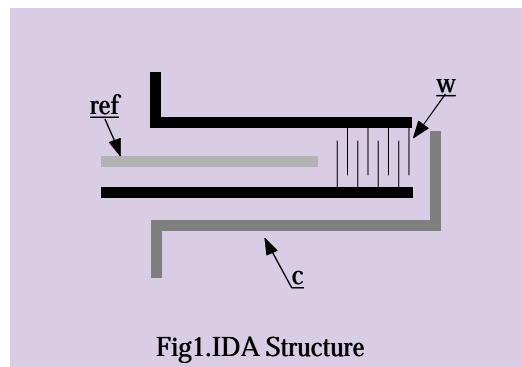


Fig1.IDA Structure

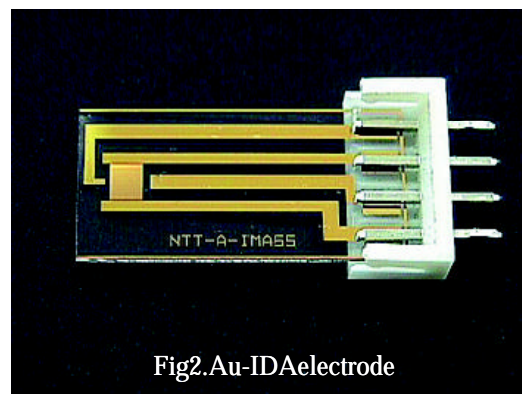


Fig2.Au-IDAelectrode

CV measurement using Interdigitated Array Electrodes

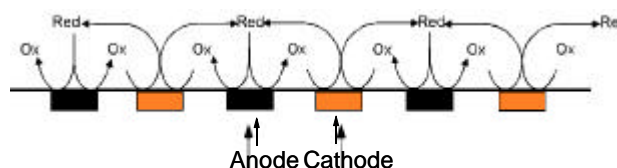


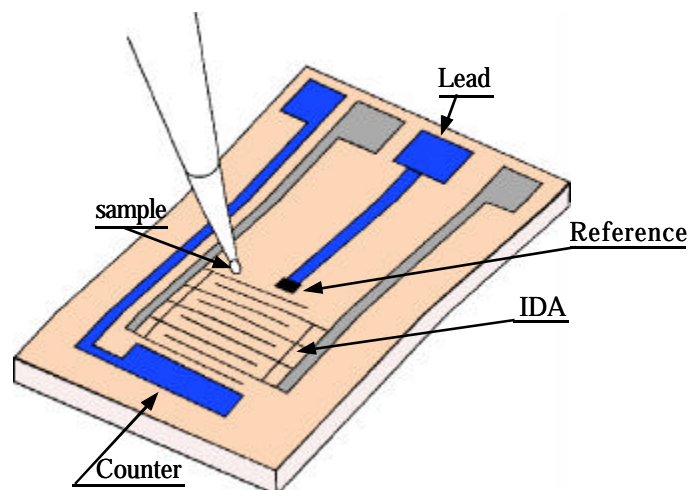
Fig3.Electrochemical redox cycle

Cat No.	Description	Width(μm)	Interval(μm)	Length(mm)
002047	IDA Electrode Au	10	5	2
002048	IDA Electrode Pt	10	5	2
002049	IDA Electrode C	10	5	2

IDA Electrode is a pair of band electrode combined and works with each other as a generator electrode and collector electrode, therefore it is possible to make an electrochemical redox cycle upon the electrode as showed in figure. By occurring the redox cycle on electrode increasing electrolysis current to raise measurement sensitivity. In experiment using common electrodes to analyze a small quantity of sample solution, the sample will consumed and exhausted due to electrolysis. However using this Interdigitated array electrode, the oxidation-reduction reaction occur repeatedly so the sample solution will not exhausted.

Figure4 show voltammogram of 10 μL (a) (c) and 0.2 μL (b) (d) Ferrocene sample dropped on IDA electrode. The difference between dual mode (a) (b) using both electrode to perform redox cycle and single mode (c) (d) which only one reaction (oxidation or reduction) occur at time can be found clearly. In dual mode (a) (b), the increase of oxidation current on generator electrode will followed by increasing of reduction current on collector electrodes. In (d), response become very small because consumption of object substance due to electrolysis.

Fig4. Fingerprint analysis by IDA electrode



We have 3 kinds of IDA electrode made of Gold(Au), Platinum(Pt) and carbon(C). For example, IDA electrode is constructed by Working electrode, counter and reference electrode, and their electrode is made of Au, Pt or C.

If you want to use silver/silver chloride as reference electrode, You should use silver paste glue as reference electrode, that is, it is coated onto reference electrode area, and then it is dried in the room. Silver glue was completely coated, and then silver area was plated by silver/silver chloride solution by Reagent - UniJet reference electrode solution in squeeze bottle(CF-2200) supplied by bioanalytical system. It is easy to make Ag/AgCl layer on Ag paste.

Or To make Ag/AgCl from a Ag wire, I usually put the Ag wire in 100mM KCl in H₂O, then apply approx. 100uA (with graphite counter-electrode, "+" at Ag, which gets approx. 1 V potential) and leave it for 24 hours.

Operation:

IDA electrode is very fragile, and it is important to handle with it carefully, for example, Gold and carbon electrode are especially fragile, because if their fingerprint electrodes are hit by spatula, forceps or other tool, fingerprint may be damaged. Pt electrode is harder than other electrodes.

If it was used by CV or other techniques, its surface electrode was cleaned by ozone cleaner or dip it into alumina slurry solution (0.05um alumina) and sonicate it for several minutes.

