



Hermes is based on Electrochemical Impedance Spectroscopy (EIS) and Flow Injection Analysis (FIA). It uses a gold μ -electrode, a nanoliter sized flow-cell in a wall jet configuration ($0.5\mu\text{l}$), a sampling valve and a μ -pump. Especially developed at CNR-IIA for Hg speciation in air and wet depositions, **Hermes** is a new sensor which does not require any sample pre-

I
M
P
E
D
I
M
E
N
T

treatment, is very sensitive, can reach ultra trace level, does not require significant power supply. Hg(I) and Hg(II) from wet deposition are electrochemically reduced to Hg(0) and deposited on a gold electrode. Similarly Hg(0) from air spontaneously reacts on gold electrode for giving amalgam. EIS allows to query the electrode surface. After several EIS measurements, Hg(0) can be easily removed for recovering the initial gold surface by electrochemical oxidation. Analysis rate: 3-12 samples/h. $\text{Lod}=0.06\text{ppq}$. $\text{Loq}=0.10\text{ppq}$. Electrode saturation= 5pg . Saturation capacity= $0.6\text{ng}/\text{cm}^2$. Flow rate= $25\text{--}100\mu\text{l}/\text{min}$ Loop= $140\mu\text{l}$. Low volume, surface and flow rate play a fundamental role in **Hermes'** high performances.

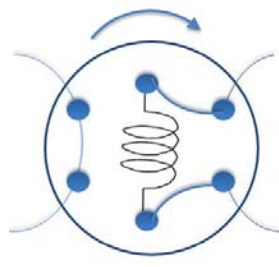
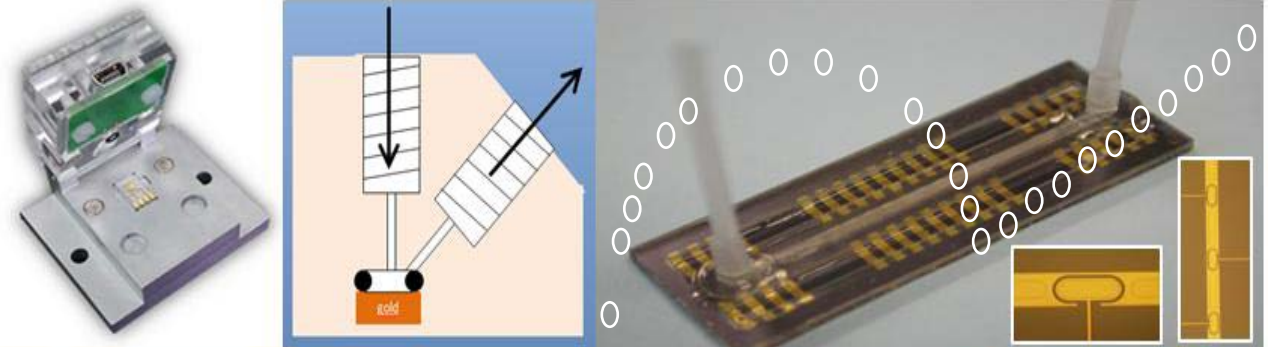
E
L
E
C
T
R
O
N
I
C

S
T
O
M

H E R M E S BRIEF DESCRIPTION AND PRINCIPLE CNR-IIA

I
G
H
T
L
Y
N
S
I
T
I
V
E
O
C
H
I
M
I
C
A
L

E
R
C
U
R
Y
R
E
S
O
R



1) acquisition of the impedance spectrum on bare μ -gold electrode in static conditions using the carrier solution and a scanning frequencies from 0.1Hz to 20kHz with a potential amplitude=10mV. 2) Load 140 μ l loop with an air sample. 3) Injecting the loop in the carrier solution at a flowrate = 25-100 μ l/min. A small amount of the total mercury present in the sample reacts with the surface of the gold electrode by changing its impedance. The amount of mercury adsorbed is proportional to the contact time of the sample with the electrode and the concentration of mercury in the sample. As the contact time depends on the flow rate which is constant in the range between 25 and 100ml/min, at the end the quantity of mercury on the electrode is proportional only to the concentration in the sample. 4) Measure: Acquisition of impedance spectrum. 5) Repeat the steps 2 to 4 for several samples. 6) Recover the gold surface by electrochemical oxidation at 1.2V vs Ag/AgCl . Hg(I) and Hg(II) in wet depositions require a preliminary electrochemical step for reducing these species to Hg(0) (-400mV vs Ag/AgCl)

1) Meas

2) Load

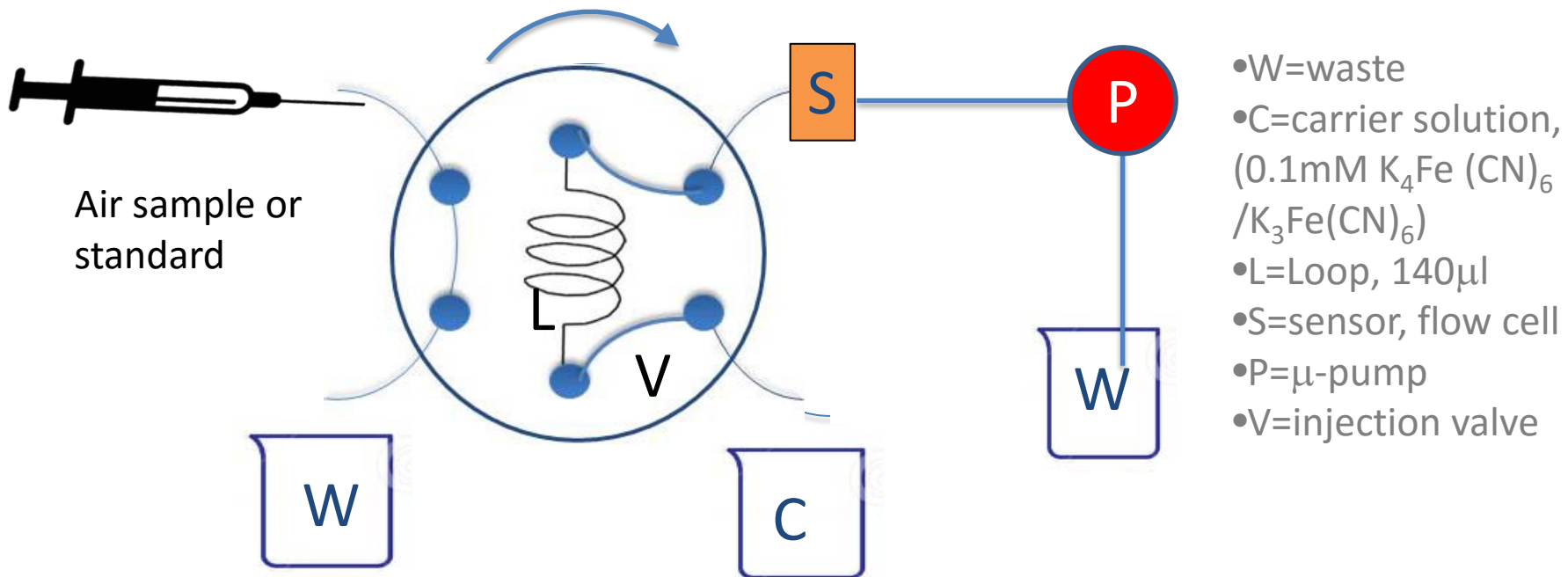
3) Inject

4) Meas

H E R M E S

FLUIDIC CONFIGURATION & PROCEDURES

CNR-IIA





This work of [Roberto Pilloton](#) is distributed with [Creative Commons License Attribution - Share Alike 4.0 International](#).

Based on a work at [COSMIC By R.Pilloton](#).

Permits more than the purpose of this license may be available at www.biosensing.net/licence.htm.

Please contact [Roberto Pilloton](#) if you like to use the content of this website
[Roberto Pilloton visit card](#)