A Practical Experimental Design to Sweep Current in Polarography without Sacrificing Precision

Qinshu Sun¹ and Jianmin Xu²

¹Department of Bioelectrochemistry and Pharmaceutical Chemistry, Jining Medical College, Shandong 272013, China ²Jining Dongsheng Electronics, Inc., Shandong 272000, China

We designed a novel potentiometric polarography sweeping current to measure voltage, which is distinguished from a traditional polarography such as single sweep polarography or square-wave polarography using voltage sweep rather than current. The results showed current sweep initialized electroactive material redox changing the voltage to achieve a polarogram. We demonstrated a practical experimental set of electrochemical analysis including current linear scan, potentiometric cycle, potentiometric stripping analysis and stripping voltammetry, indicated enhanced sensitivity of 1-2 magnitude above traditional polarography. The detecting limit of current linear scan is 20 nM for Cd (40~50000 nM linear) and 50 nM for Pb (100~60000 nM linear). The detecting limit of potentiometric stripping analysis is 5 pM for Cd (10~20000 pM linear) and 10 pM for Pb (10~30000 pM linear). It solves the sensitivity limit in a traditional polarography caused by charging current, which is decreased to approximately zero in this current sweep method. This work was supported by Shandong Department of Education J01B05, and under patent application in P. R. China.