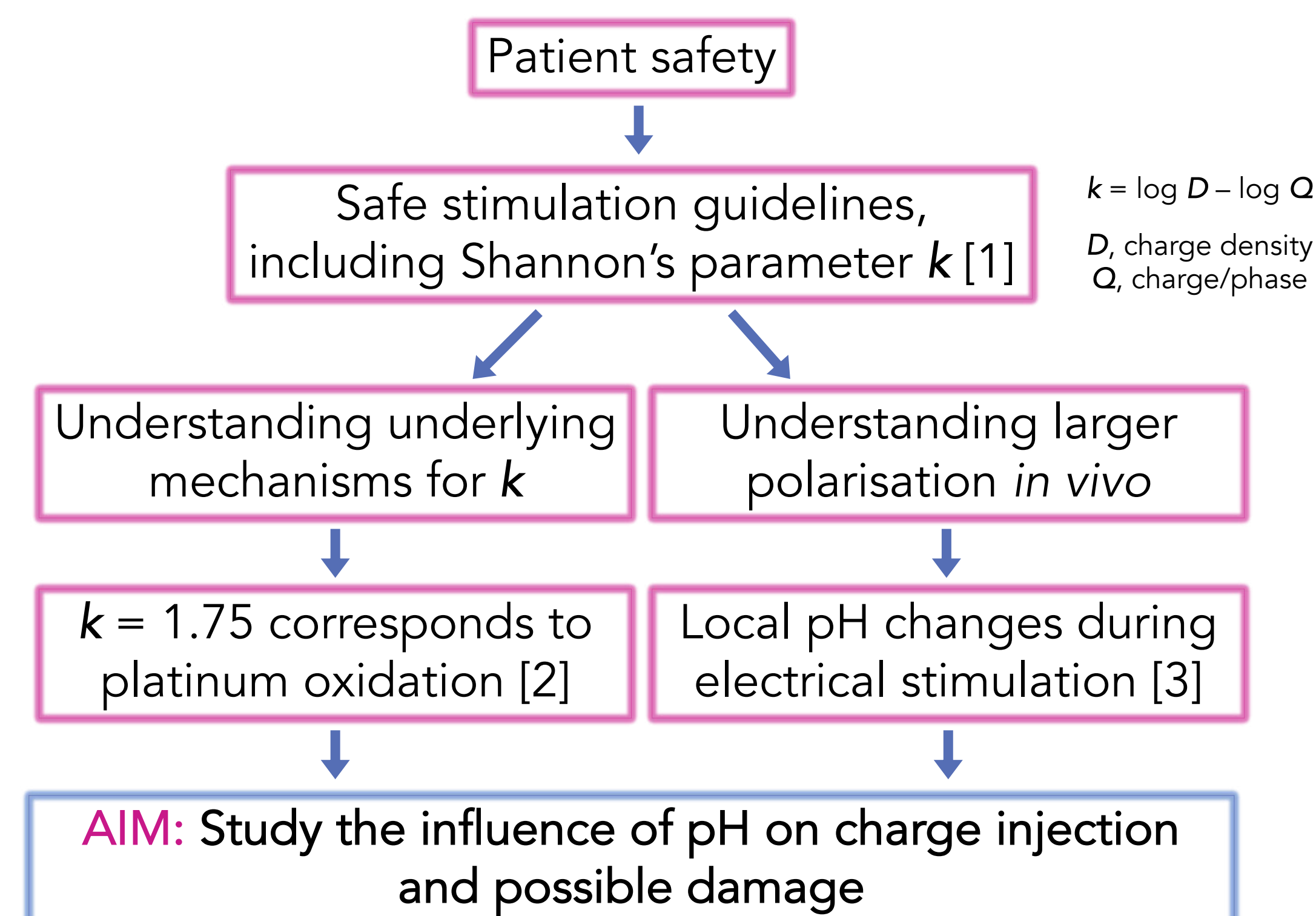


INTRODUCTION



METHODS

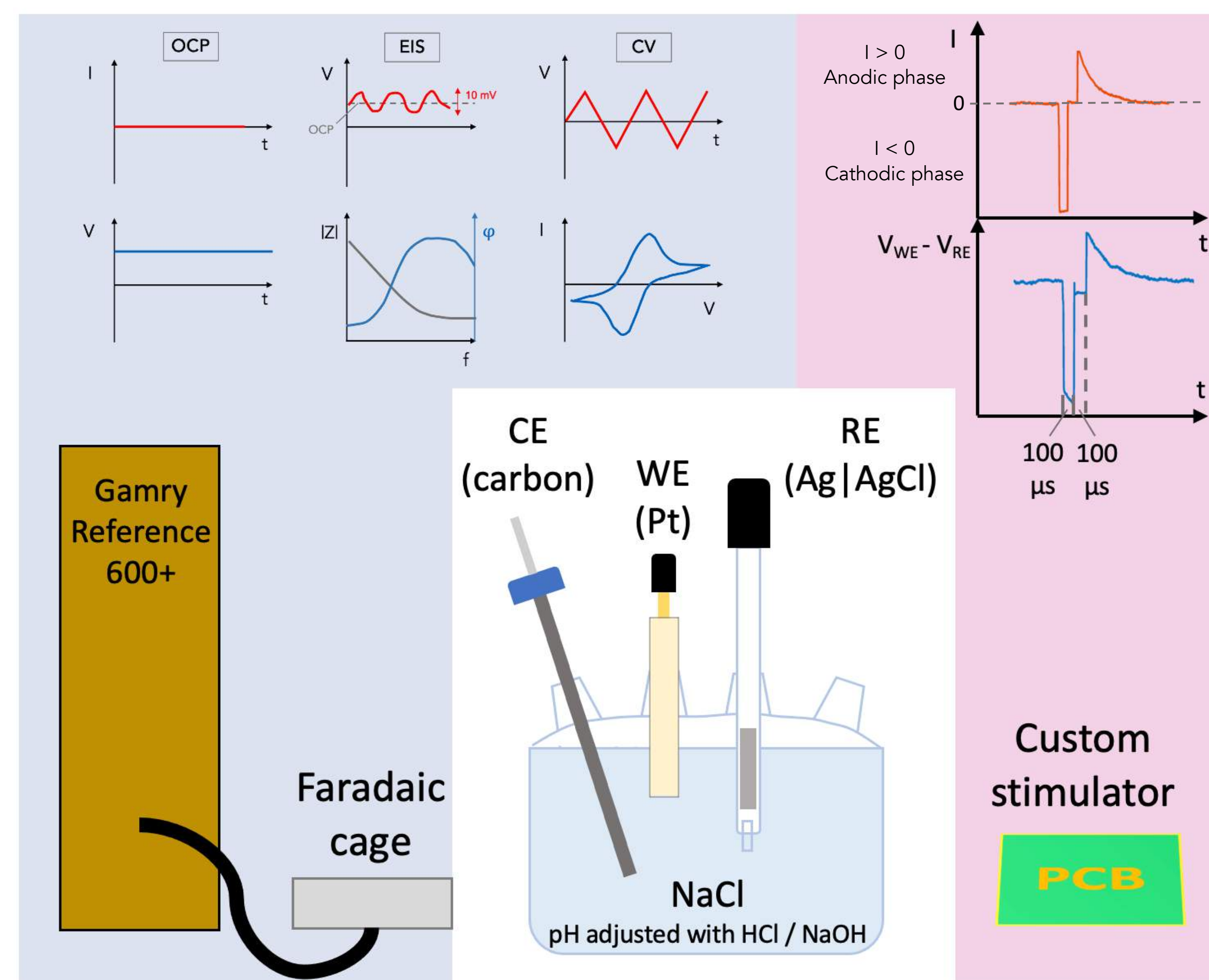


Figure A: Experimental setup scheme. The blue area represents the electrochemical testing part, the pink area represents the stimulation part. After electrochemical tests, a train of 1000 pulses was applied and the working electrode potential was recorded on an oscilloscope.

RESULTS

- Potential ratcheting was observed for every solution (fig. B).
- pH 1: at $k \geq 1.75$, the anodic potential entered an oxidation peak region, and the cathodic potential reached the second reduction peak (fig. C).
- pH 4, 6 & 10: at $k \geq 1.66$, the cathodic potential entered the main oxide reduction peak, marking a plateau. The anodic potential remained stable/decreased with k and abruptly increased at $k \geq 1.85$ for pH 4 and $k \geq 1.66$ for pH 6 & 10 past the platinum oxidation peak (fig. C).
- pH 12: anodic potential remained stable in the oxide formation peak and cathodic potential decreased abruptly at $k \geq 1.55$, entering the main oxide reduction peak, and decreased slightly at higher k (fig. C).
- CV (fig. E) and EIS (fig. F) were similar for $4 \leq \text{pH} \leq 10$, due to local pH changes at the electrode surface. pH 12 had similar peaks on CV and slightly lower EIS modulus. pH 1 EIS and CV profiles were noticeably different; the oxide reduction peak split into 2 distinct peaks.

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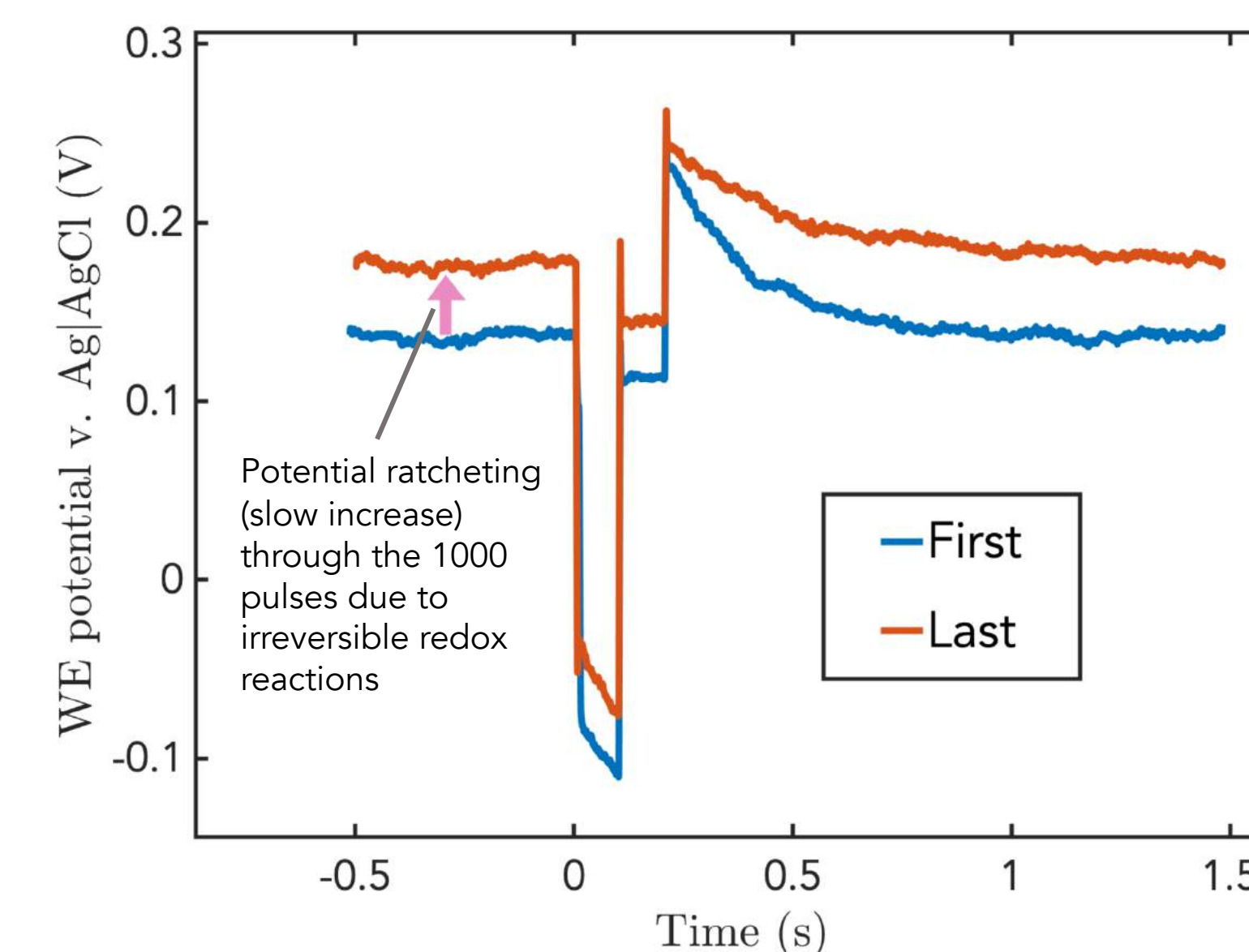


Figure B: Working electrode potential ratcheting between the first and 1000th pulse.

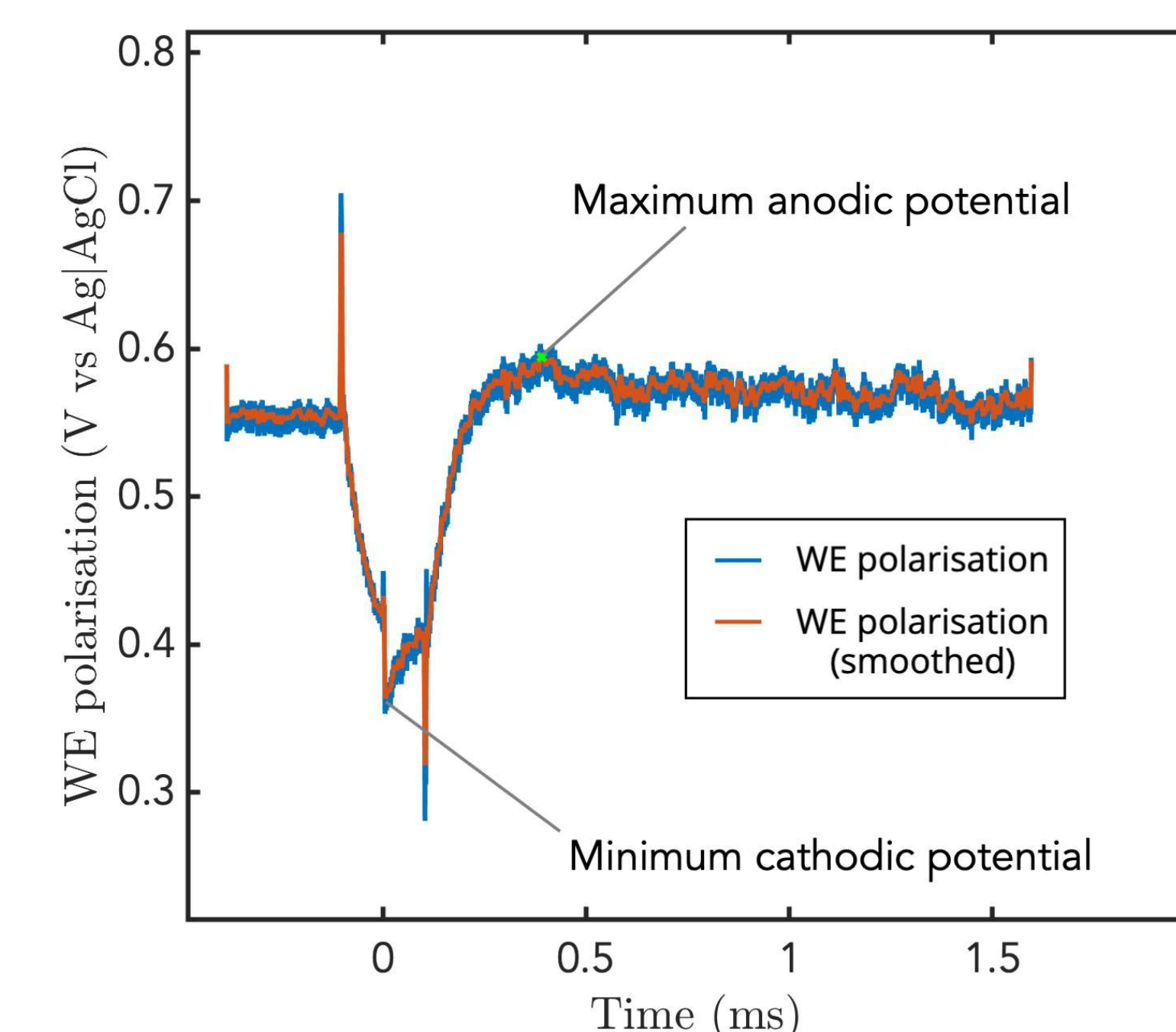


Figure D: Working electrode polarisation during the 1000th pulse.

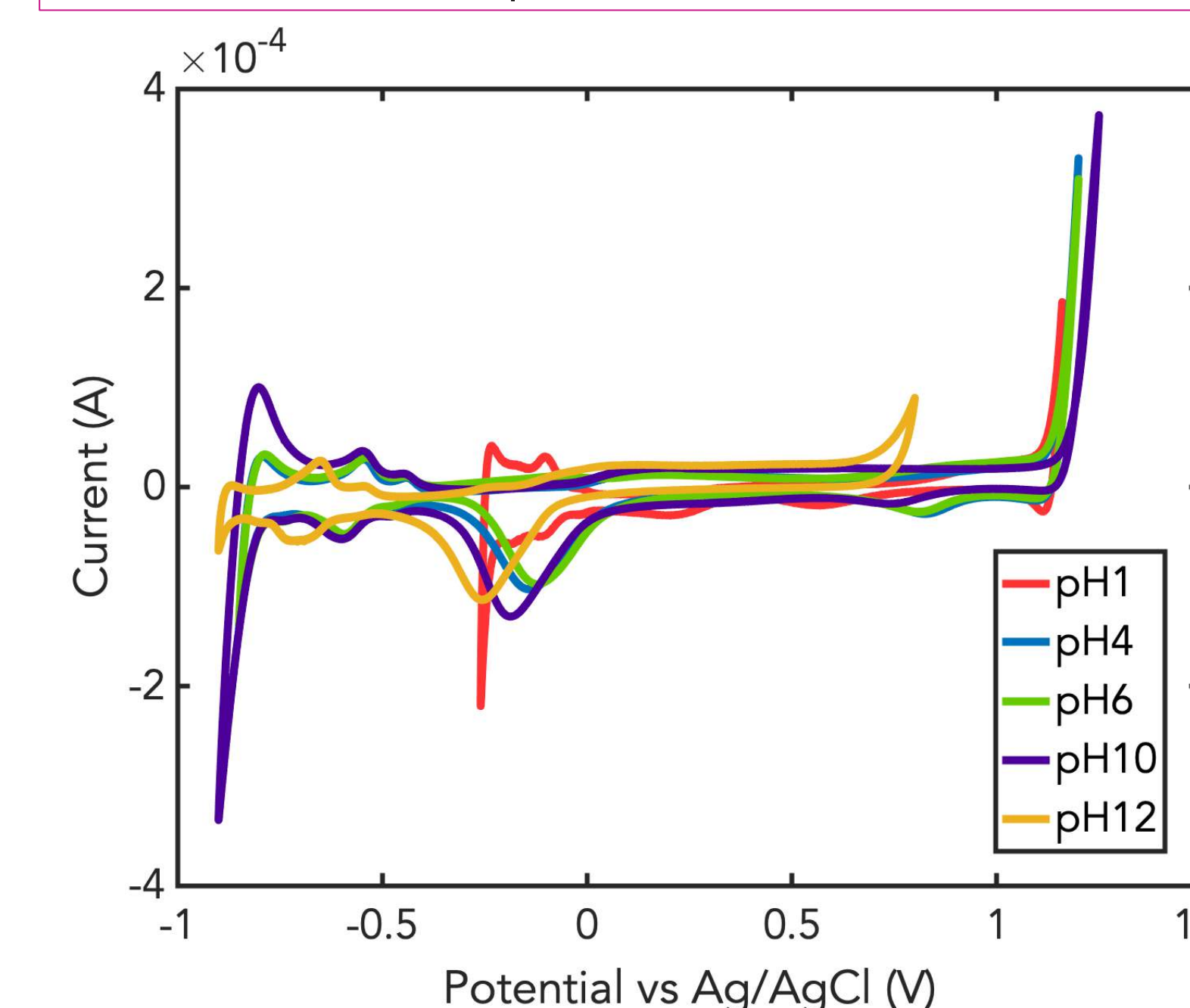


Figure E: Cyclic voltammogram for each pH value.

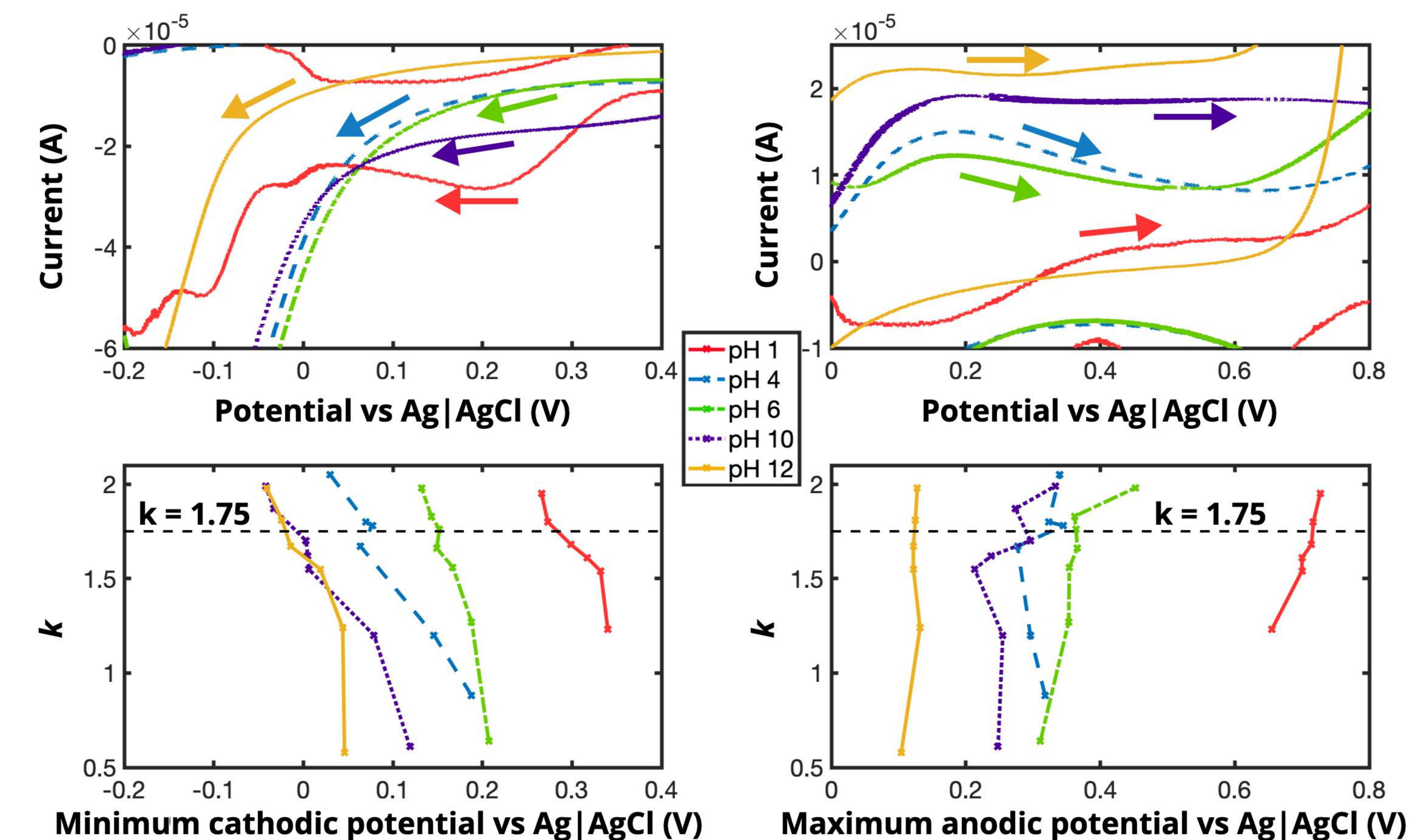


Figure C: Extreme potentials reached during the cathodic (left) and anodic (right) phases for each k value. Above, cyclic voltammograms were aligned to identify corresponding reactions. Arrows indicate the sweep direction.

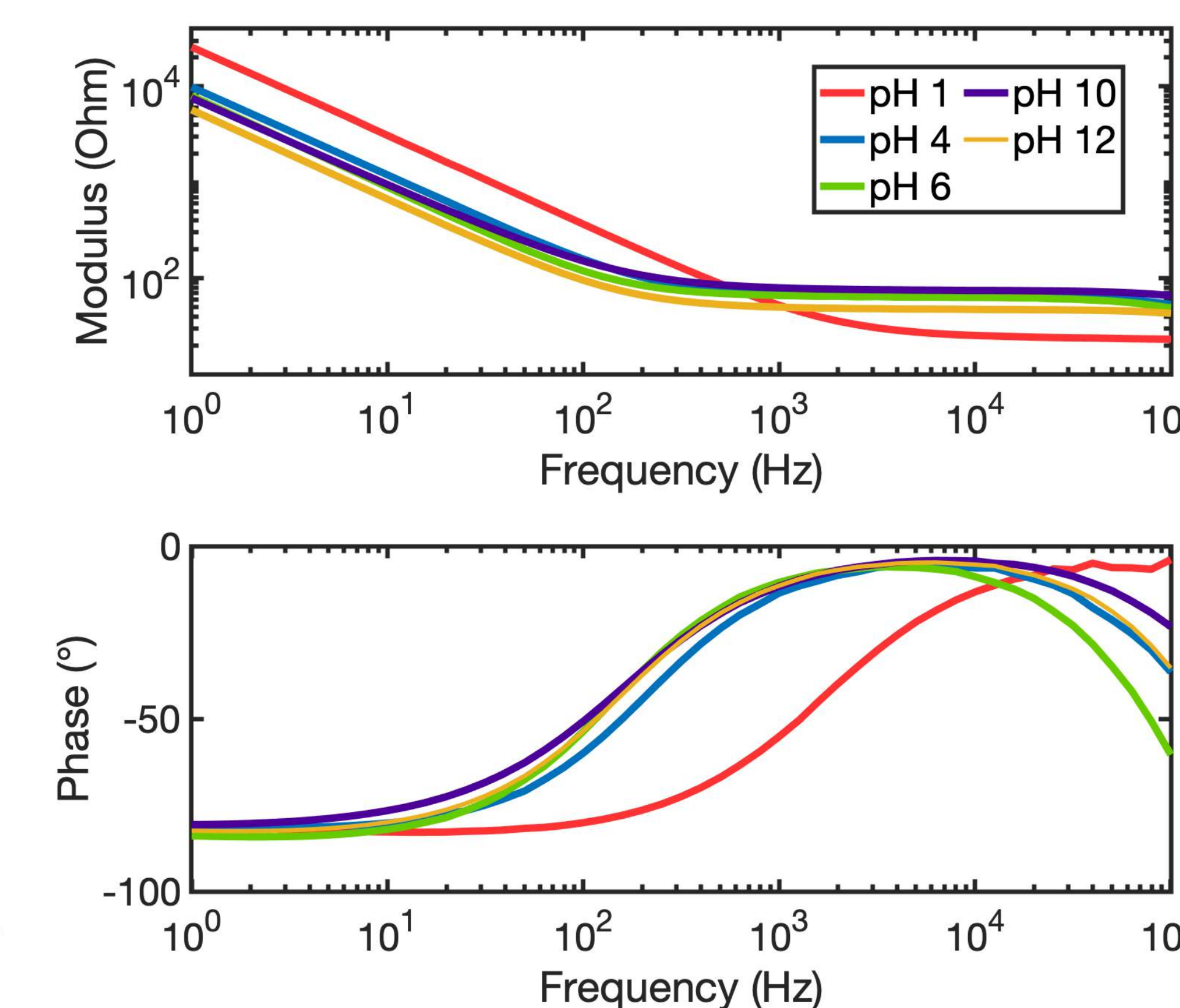


Figure F: EIS modulus (top) and phase (bottom) for each pH value.

CONCLUSIONS

- Potential ratcheting occurs independently of pH.
- Shannon's safe stimulation limit coincides with oxide reduction at all pH values.
- Cycles of platinum oxide formation/reduction generate platinum dissolution, which is a plausible damage mechanism described by k .
- This study does not give evidence for a need to change k for different tissue pH or foreign body response.

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