Is there a single parameter that defines peak currents in square-wave voltammetry?

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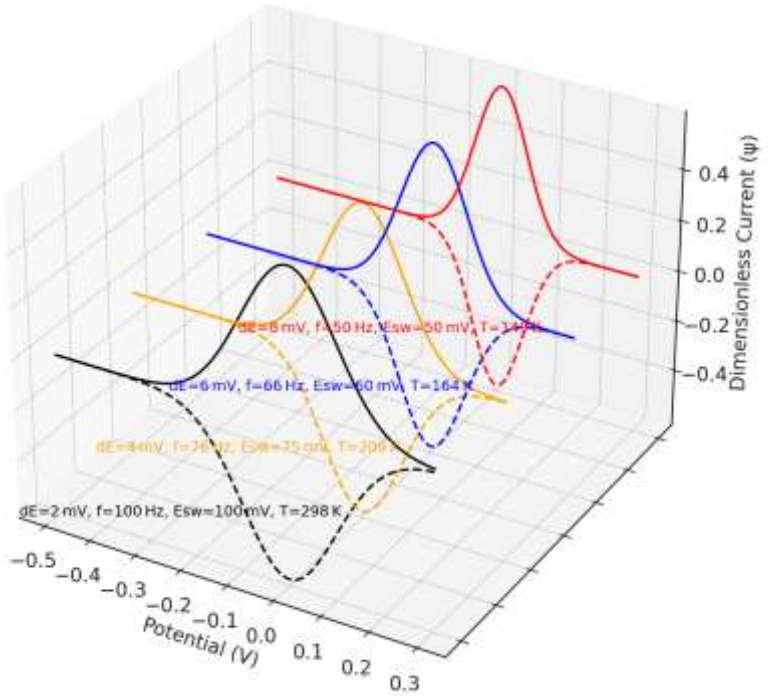
Abstract:

In the pursuit of a unifying parameter that governs peak currents in square-wave voltammetry, a series of simulations was conducted on Nernstian, thermodynamically reversible electrode systems. Due to the complex interplay among the potential step, square-wave amplitude, frequency, and temperature. which collectively influence the formation and disruption of concentration profiles within the diffusion layer during each pulse, it is considerably more challenging to identify a single defining parameter for peak current, unlike in linear scan voltammetry. Nonetheless, the simulations revealed that the dimensionless parameter **JKG**, defined as:

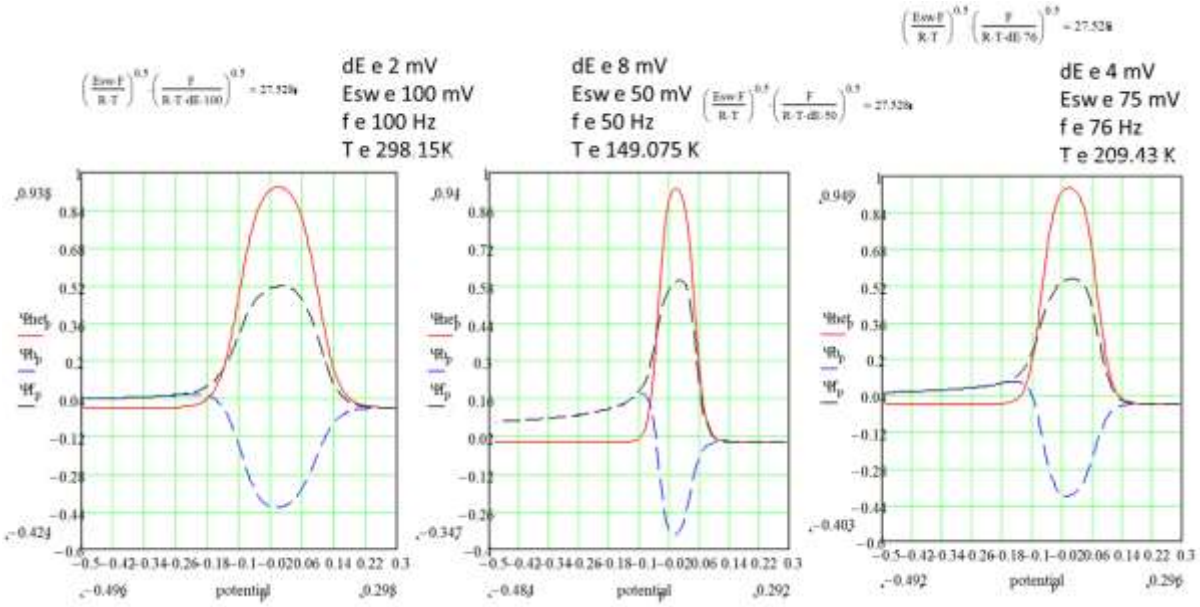
JKG = F(RT)^-1·[Esw/(dE·f)]^1/2

is critical parameter (assuming a constant diffusion coefficient) for describing peak current behavior in square-wave voltammetry. This parameter, herein named the **Janeva–Kokoskarova–Gulaboski (JKG) parameter**, is identified for the first time as a key descriptor of peak current magnitudes under square-wave voltammetric conditions.



Effect of the potential step, frequency SW amplitude and temperature (via unified parameter "JKG") to the forward and backward peak currents of calculated Square-wave voltammograms of Nernstian reversible systems

Voltammograms showing how the Parameter “Janeva-Kokoskarova-Gulaboski”-JKG governs peak currents in SWV



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