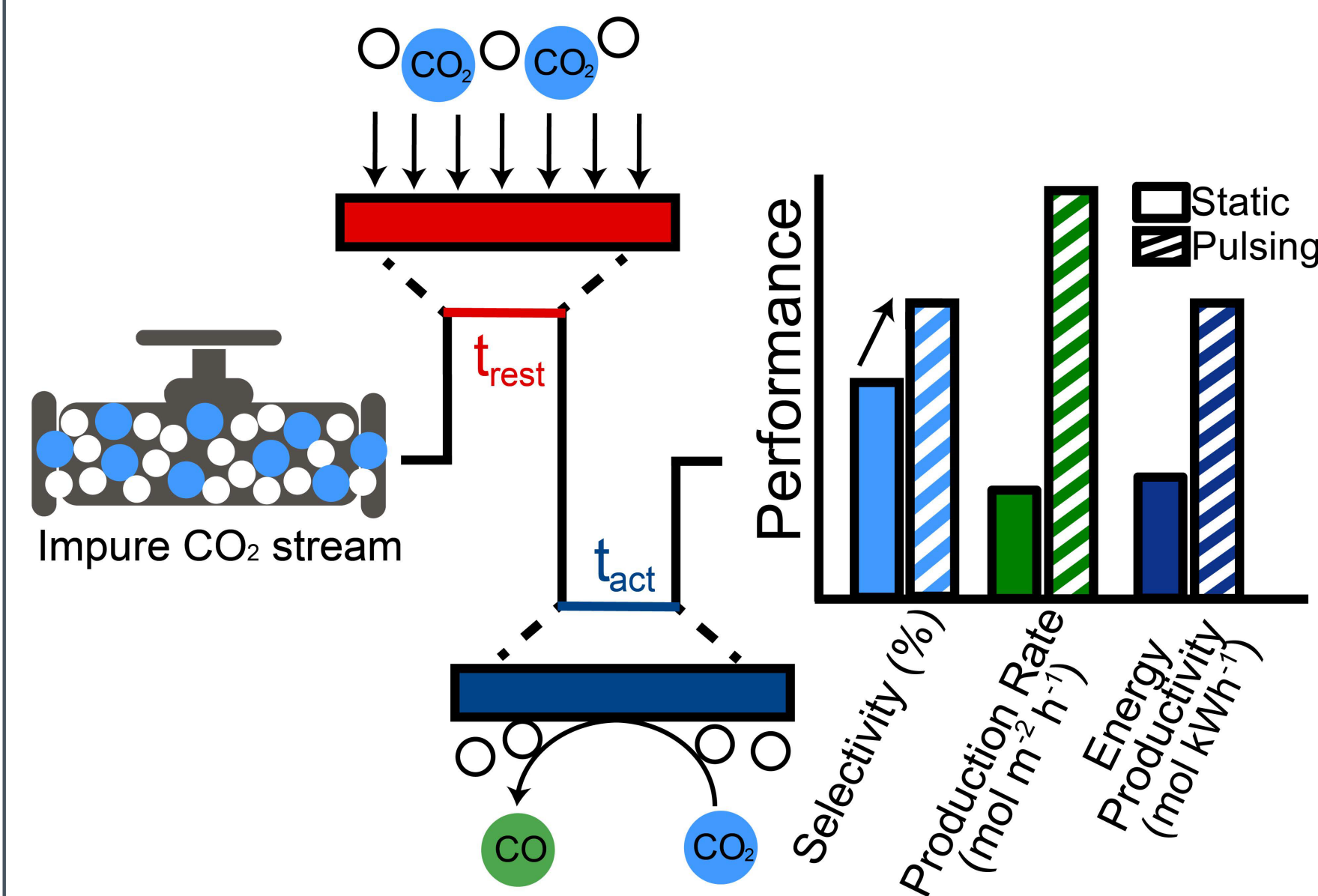




Introduction

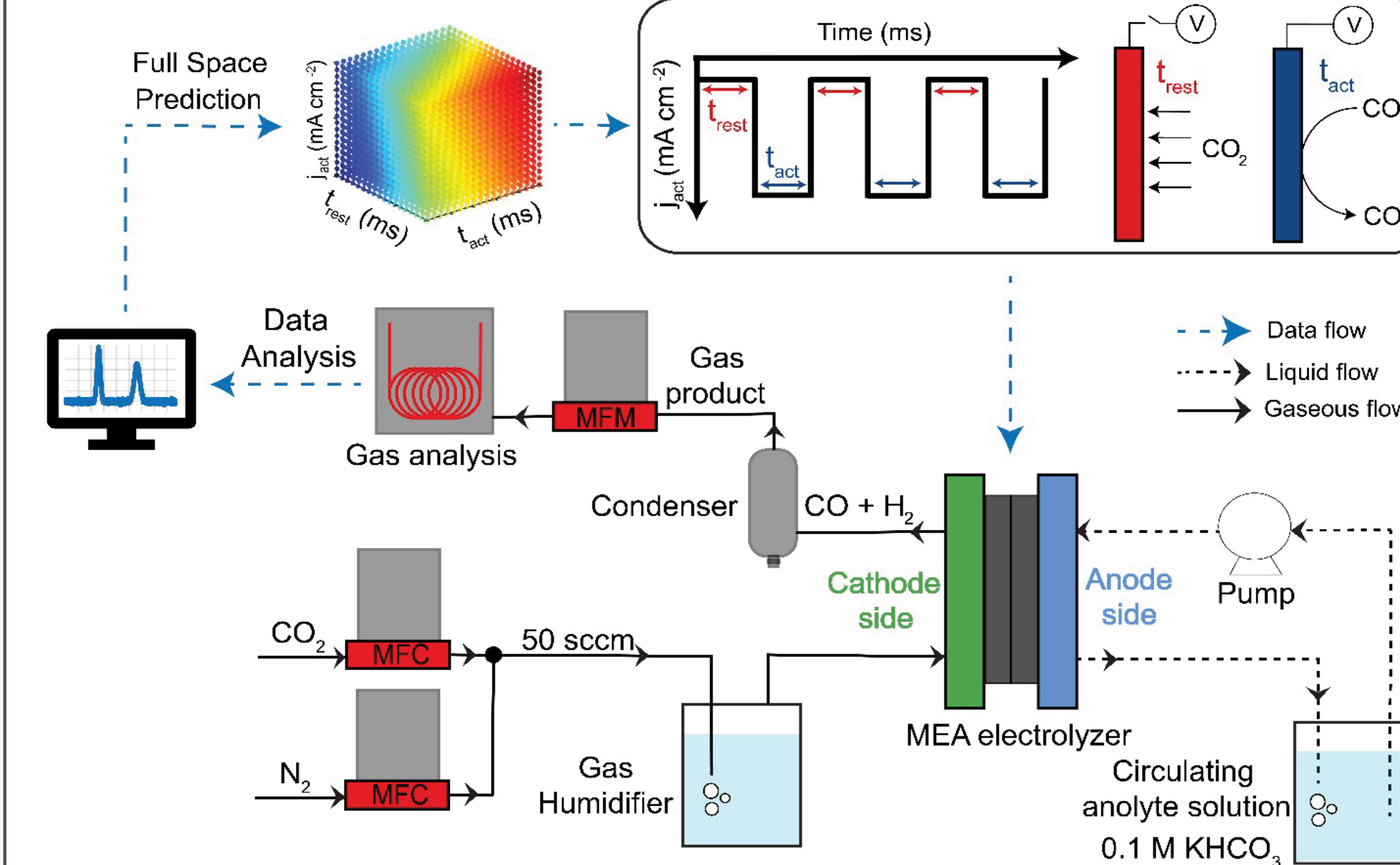


Industrial CO₂ emissions are often dilute, resulting in mass transport limited direct conversion or costly preseparation.

Pulsing has been shown to improve performance of dilute CO₂ reduction

To elucidate the mechanism of enhancement, continuum modeling can be used to probe the transient behavior difficult to study experimentally.

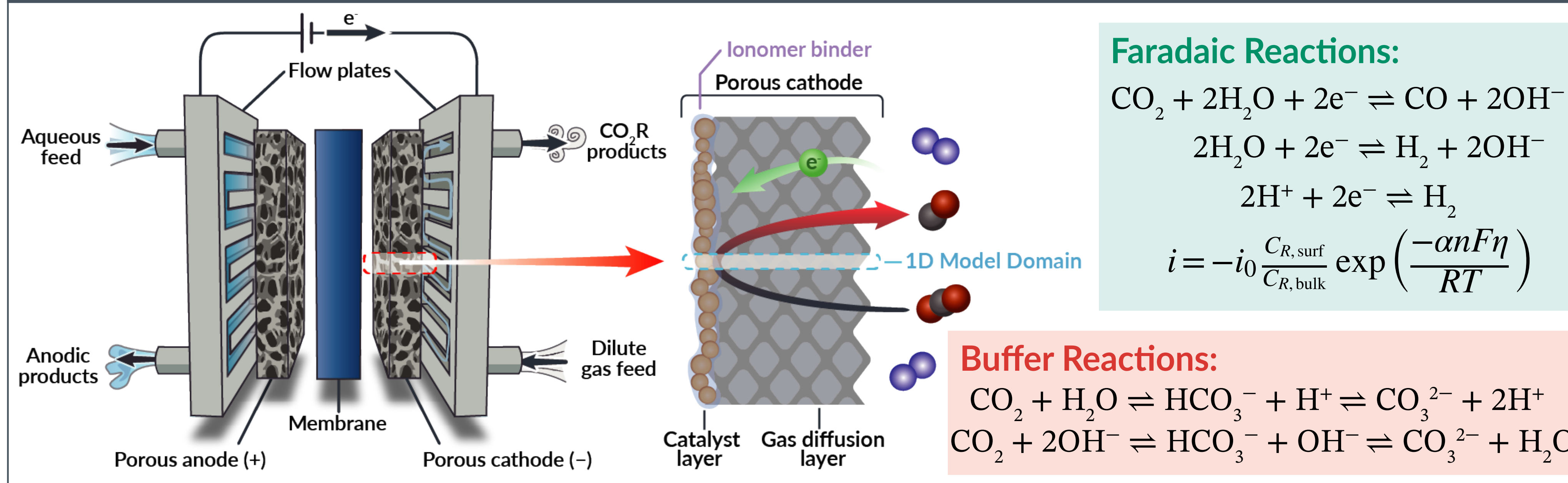
Experimental System



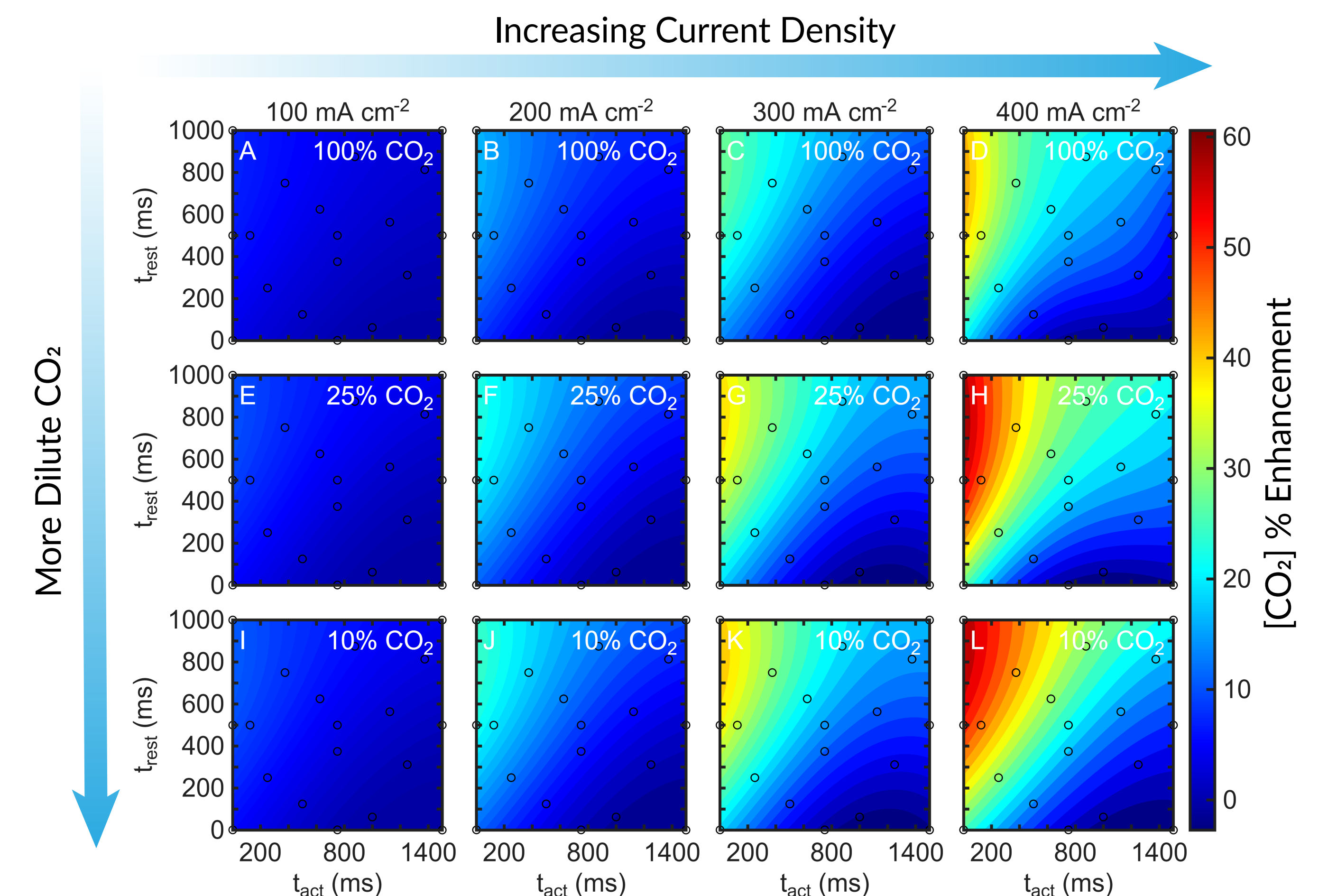
Optimal pulsing improved CO selectivity, production rate, and energy productivity compared to constant current.

Greatest enhancement from pulsing when the system is most mass transport limited — at higher active current densities and more dilute CO₂.

Continuum Model Development



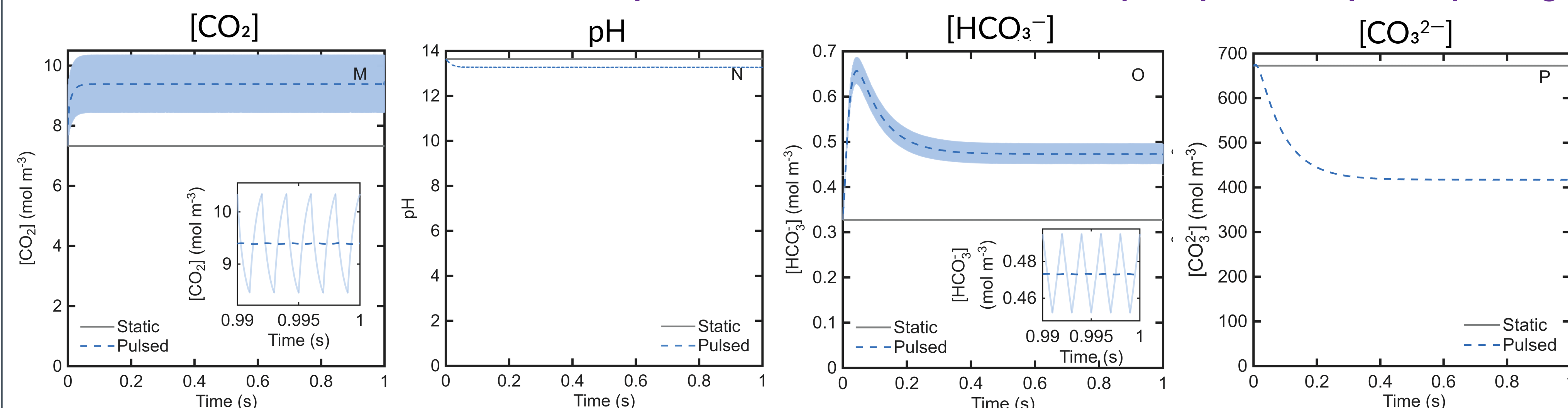
Gaussian Process Regression Model Results



Pulsing can increase the CO₂ concentration in the catalyst layer by over 60% in mass transport limited regimes.

Transient Model Results

The time dependent model resolves the transient electrocatalyst microenvironment, revealing greater CO₂ concentration and more favorable pH buffer conditions in the catalyst layer with optimal pulsing.



Conclusions and Acknowledgements

Optimized pulsing can overcome mass transport limitations in dilute CO₂ electroreduction, but fitting kinetics to experiment is needed.



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