Electrified bubbles

The formation of bubbles at electrodes is a ubiquitous problem in technologies from batteries to industrial smelting. An adhering gas bubble will mask a portion of the electrode, preventing fresh solution from reaching it. Consequently, electrochemists and engineers unanimously regard surface bubbles as redox-inactive passivating entities. But now a team of researchers from Curtin University, the Australian National University, the University of New South Wales and the University of Western Australia has demonstrated that this is not case: bubbles adhering to an electrode surface initiate the oxidation of water-soluble species under conditions for which such reactions would normally be considered impossible (Vogel Y.B., Evans C.W., Belotti M., Xu L., Russell I.C., Yu L.-J., Fung A.K.K., Hill N.S., Darwish N., Gonçales V.R., Coote M.L., Iyer K.S. Ciampi S. *Nat. Commun.* 2020, **11**, 6323). By coupling fluorescence microscopy, electrochemistry and multi-scale modelling, the researchers revealed that the corona of a surface bubble accumulates an unbalanced excess of hydroxide anions, reaching pH 14 even in ultra-pure water. This excess causes the oxidation of hydroxide to hydroxyl radicals to occur at potentials more than 0.7 V below tabulated values. The downhill oxidation shift in a bubble's corona is likely to be a general mechanism involved in the initiation of heterogeneous electrochemical oxidations in water and could be harnessed in chemical synthesis.