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Title	Unintended cation crossover influences CO_2 reduction selectivity in Cu-based zero-gap electrolysers
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Aims	We aimed to understand the origins of cell performance degradation which is caused by salt precipitate formation in membrane-electrode assemblies for CO_2 conversion. We hypothesized that decreasing the electrolyte concentration would decrease the movement of cations through the membrane which contributes to this degradation.
Why is this important?	The influence of electrolyte cations on electrochemical reactions is well studied in laboratory scale experiments, but questions remain about how cations impact the behaviors of industrially relevant device configurations. This represents a knowledge gap between fundamental and applied research. Understanding cation effects in membrane-electrode assembly devices is critical for advancing the technology of CO_2 conversion in practical devices.
What methods were used?	Gas diffusion electrodes with copper catalysts were studied in a membrane-electrode assembly cell using anion exchange membranes. Their electrochemical CO_2 conversion activities were tested using a range of electrolyte concentrations. Gas chromatography was used to determine the production of various products.
What was learned?	We observed that the distribution of major products of CO_2 conversion was strongly dependent on the electrolyte concentration, and this correlated with the amount of undesired cation crossover through the membrane. High concentrations gave lots of crossover and resulted in production of C_{2+} products like ethylene, whereas low concentrations exhibited minimal crossover and produced predominantly carbon monoxide. Thus, even in the absence of electrolyte at the cathode, CO_2 electrolyzer performance is highly dependent on the presence or absence of electrolyte ions passing through the membrane.
How could this research benefit citizens, society and other researchers?	These findings show researchers in this field that the electrolyte concentrations most often used do not lead to effective ion exclusion by ion exchange membranes, and that lower concentrations can result in drastically different electrode behaviors. This new insight will help further the development of electrochemical approaches to CO_2 conversion as a route toward a carbon-neutral society.
Link to full paper/abstract	https://www.nature.com/articles/s41467-023-37520-x