A 200-word writing sample (you can summarize a recently published paper, report on a significant sustainability development or reflect on an emerging sustainability debate)

Massen-Hane, M., Diederichsen, K.M. and Hatton, T.A., 2024. Engineering redox-active electrochemically mediated carbon dioxide capture systems. *Nature Chemical Engineering*, *1*(1), pp.35-44.

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**Summary**

The perspective by Massen-Hane and co-workers centers around the need for low-cost carbon dioxide capturing technologies, particularly, Electrochemically Mediated Carbon Capture (EMCC). In the article, four separate strategies for EMCC are discussed with distinct process configurations, each employing redox-active sorbents. Out of these, the two-stage process is shown to be closest to the thermodynamic limit for work of separation. The congruence to the associated chemistry for this separation is explained through electrochemically mediated amine generation (EMAR). Electrochemical reactors needed to achieve the necessary change in potential of sorbents are shown to be dependent on kinetic and mass transfer limitations, posed by electrode and electrolyte design, respectively. A trade off arises between the two stage and four stage processes with respect to transport and energy requirement considerations. The operational challenges are further elucidated by introducing carbon dioxide bubble remediation and limiting their formation through effective design strategies. For the separation processes, the article is concluded with an extended note on the scaling and economic considerations to be included for designing an optimum electrochemical unit. The various advantages of the EMCC scheme are balanced with scoping and highlighting key areas of improvement, with a careful outlook towards the future.