Carbominer DAC technology relies on a combination of dry and wet capture approaches in the same process at the capturing stage and on electrochemistry-based pH-swing regeneration on CO2 release stage.

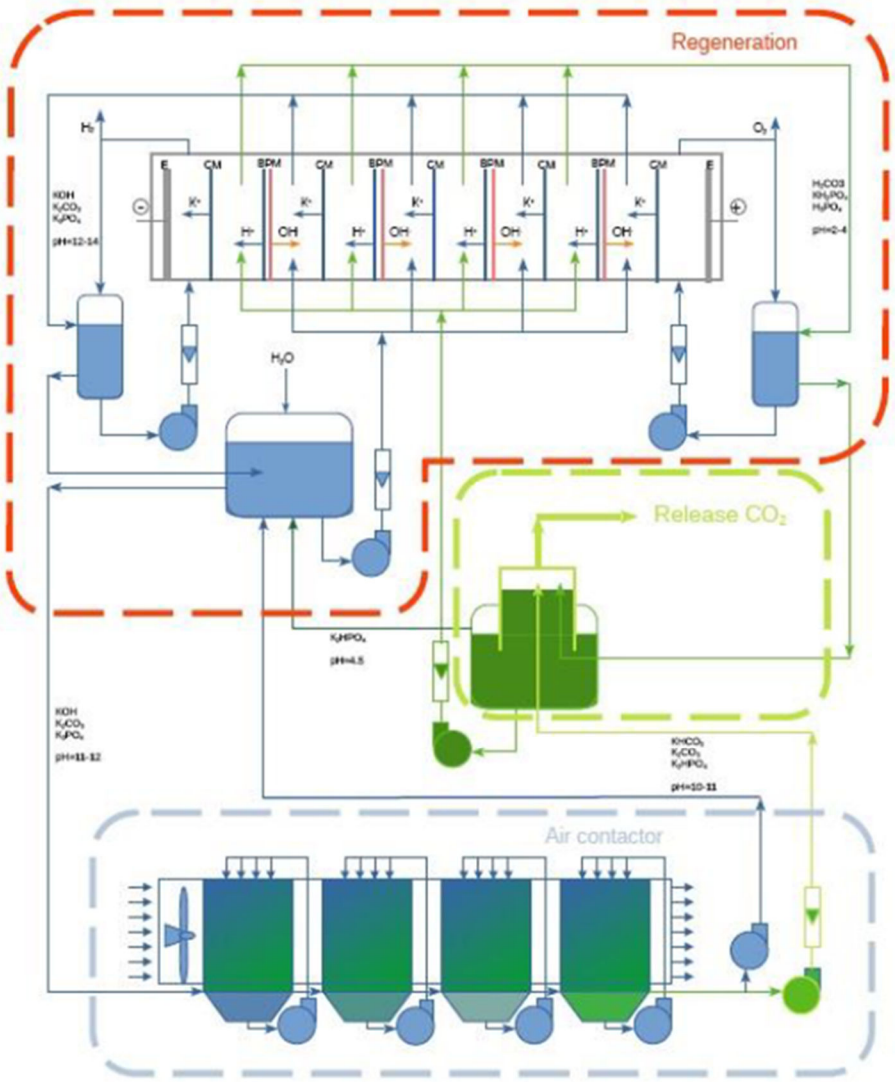
The process starts with capturing stage. For capture we use air contactor filled with vertical sheets of ion-exchange fiber sorbent (based on polyacrilnytrilic fiber activated with functional groups). The sorbent is able to capture molecules of CO2 from the ambient air being dry.

After about 2 hours of capturing the fan stops and the sorbent is washed out from the top with the alkaline solution (working liquid is electrolyte containing potassium carbonate and potassium phosphate as working salts). The liquid takes molecules of CO2 from the sorbent and goes to the tank under the air contactor as a CO2 enriched solution, just following the gravity.

The capturing stage is over and the regeneration stage starts here. The pump sends the enriched solution from the tank under air contactor in the capturing unit to the regeneration unit.

The core of the regeneration unit is electrodialysis which provides the pH-swing. The electrodialysis uses electric current to split a working electrolyte stream into two sub-streams: one is acid and the other is alkaline. The acid sub-stream is then mixed with the enriched solution in the releasing camera, where CO2 is released as a gas. The alkaline sub-stream is returned to the capturing unit for next washings of the sorbent.

The structural view of the DAC machine is shown in Fig. 3.



Experimental Program

3.1. Process description and flowchart

Key process of the Carbominer DAC technology is electrochemistry-based pH-swing.

It means that CO2 release from the enriched solution will be achieved with electricity only. No heat energy source is needed during regeneration.

The flowchart of the proposed pH-swing process with is shown on the Fig. 4.

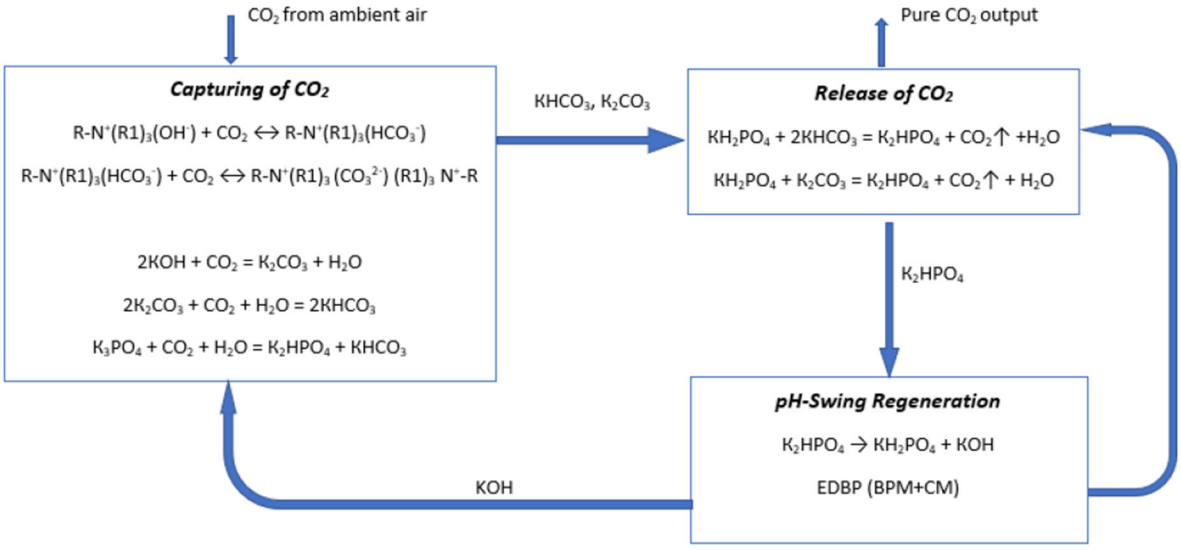


Fig. 4 Flowchart of the electrochemical process used in the DAC machine.