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(54) Title: DIRECT AIR CAPTURE APPARATUS AND PROCESS AND SYSTEMS FOR THE SAME

(57) Abstract: Disclosed herein are direct air capture (DAC) apparatuses and process and systems implementing the same. The disclosed DAC apparatus and system comprise a sorbent bed comprising a sorbent material, the sorbent bed operating at a temperature from 160 K to 240 K, a heat exchanger configured to receive a second fluid and conduct a heat exchange between the second fluid and a first fluid in order to precool the first fluid prior to contacting the sorbent material, and a feed line connecting the heat exchanger and the sorbent bed and configured to transport the first fluid from the heat exchanger to the sorbent bed, wherein the first fluid comprises CO_2, and the sorbent material is configured to adsorb the CO_2 from the first fluid when the first fluid is in contact with the sorbent material.