CLAIMS

1. A vehicle CO_2 capture and utilization system comprising a concrete mixer vehicle and a vehicle exhaust capture system; wherein:

the concrete mixer vehicle comprises a vehicle exhaust and a mixer tank;

the vehicle exhaust capture system is located onboard the concrete mixer vehicle;

the vehicle exhaust capture system comprises one or more fluid pathways that fluidly couple the vehicle exhaust and the mixer tank; and

an auxiliary exhaust capture system that comprises one or more fluid pathways fluidly coupled to a pump exhaust of a concrete pump.

2. The vehicle CO_2 capture and utilization system of claim 1, wherein the mixer tank houses an uncured cementitious material mixture and when the concrete mixer vehicle generates CO_2 emission, at least a portion of CO_2 emission generated by the concrete mixer vehicle and output by the vehicle exhaust is introduced into the mixer tank and mixes with the uncured cementitious material mixture thereby carbonizing the uncured cementitious material mixture and forming $CaCO_3$ in the mixer tank.

3. The vehicle CO_2 capture and utilization system of claim 1, wherein:

the vehicle exhaust capture system further comprises a CO_2 capture unit that is fluidly coupled to the vehicle exhaust and the mixer tank using the one or more fluid pathways; and

the CO_2 capture unit is located onboard the concrete mixer vehicle and is structurally configured to capture CO_2.

4. The vehicle CO_2 capture and utilization system of claim 3, wherein the CO_2 capture unit comprises a housing and one or more carbon capturing structures located within the housing.

5. The vehicle CO_2 capture and utilization system of claim 4, wherein the one or more carbon capturing structures comprise amines, carbonate, ammonia, hydroxide, activated

carbons, zeolites, metal organic frameworks, mesoporous structures, carbon capture filters, fibers, microporous structures, or a combination thereof.

6. The vehicle CO_2 capture and utilization system of claim 5, wherein the one or more carbon capturing structures are configured to capture CO_2 via adsorption, absorption, or a combination thereof.

7. The vehicle CO_2 capture and utilization system of claim 3, wherein:

the one or more fluid pathways comprise a first fluid pathway extending from the vehicle exhaust to the CO_2 capture unit and a second fluid pathway extending from the CO_2 capture unit to the mixer tank;

a flow generation unit is fluidly coupled to the second fluid pathway; and

the flow generation unit is structurally configured to generate fluid flow from the CO_2 capture unit to the mixer tank.

8. The vehicle CO_2 capture and utilization system of claim 7, wherein the flow generation unit comprises a mass flow controller.

9. The vehicle CO_2 capture and utilization system of claim 1, wherein the vehicle exhaust capture system comprises a CO_2 storage tank fluidly coupled to the vehicle exhaust and located onboard the concrete mixer vehicle.

10. The vehicle CO_2 capture and utilization system of claim 9, wherein:

the vehicle exhaust capture system further comprises

a CO_2 capture unit that is fluidly coupled to the vehicle exhaust, the mixer tank, and the CO_2 storage tank using the one or more fluid pathways; and

the CO_2 capture unit is located on the concrete mixer vehicle and is structurally configured capture CO_2.

11. The vehicle CO_2 capture and utilization system of claim 10, wherein:

a fluid pathway extends between and fluidly couples the CO_2 capture unit and the CO_2 storage tank; and

a flow generation unit is fluidly coupled to the fluid pathway that extends between and fluidly couples the CO_2 capture unit and the CO_2 storage tank and is structurally configured to generate fluid flow from the CO_2 capture unit to the CO_2 storage tank.

12. The vehicle CO_2 capture and utilization system of claim 10, wherein:

a fluid pathway extends between and fluidly couples the CO_2 storage tank and the mixer tank; and

a flow generation unit is fluidly coupled to the fluid pathway that extends between and fluidly couples the CO_2 storage tank and the mixer tank and is structurally configured to generate fluid flow from the CO_2 storage tank to the mixer tank.

13. The vehicle CO_2 capture and utilization system of claim 1, wherein the one or more fluid pathways of the auxiliary exhaust capture system fluidly couple the pump exhaust to the mixer tank.

14. The vehicle CO_2 capture and utilization system of claim 1, wherein the one or more fluid pathways of the auxiliary exhaust capture system fluidly couple the pump exhaust to a CO_2 storage tank, a mixing tank, or both.

15. A vehicle CO_2 capture and utilization system comprising a concrete mixer vehicle and a vehicle exhaust capture system; wherein:

the concrete mixer vehicle comprises a combustion engine, a vehicle exhaust, and a mixer tank;

the vehicle exhaust capture system comprises one or more fluid pathways that fluidly couple the vehicle exhaust and the mixer tank;

the vehicle exhaust capture system comprises a CO_2 capture unit that is located onboard the concrete mixer vehicle and is fluidly coupled to the vehicle exhaust and the mixer tank using the one or more fluid pathways;

the vehicle exhaust capture system comprises a CO_2 storage tank that is fluidly coupled to the vehicle exhaust using the one or more fluid pathways and is located onboard the concrete mixer vehicle;

the one or more fluid pathways comprise a first fluid pathway extending from the vehicle exhaust to the CO_2 capture unit, a second fluid pathway extending from the CO_2 capture unit to the mixer tank, a third fluid pathway extending from the CO_2 capture unit to the CO_2 storage tank, and a fourth fluid pathway extending from the CO_2 storage tank to the mixer tank;

a first flow generation unit is fluidly coupled to the second fluid pathway to selectively generate fluid flow from the CO_2 capture unit to the mixer tank;

a second flow generation unit is fluidly coupled to the third fluid pathway to selectively generate fluid flow from the CO_2 capture unit to the CO_2 storage tank; and

a third flow generation unit is fluidly coupled to the fourth fluid pathway to selectively generate fluid flow from the CO_2 storage tank to the mixer tank.

16. The vehicle CO_2 capture and utilization system of claim 15, further comprising:

a fifth fluid pathway extending from the vehicle exhaust to the mixer tank; and

a valve fluidly coupled to the fifth fluid pathway to selectively generate fluid flow from the vehicle exhaust to the mixer tank.

17. The vehicle CO_2 capture and utilization system of claim 15, further comprising an auxiliary exhaust capture system that comprises one or more fluid pathways fluidly coupled to a pump exhaust of a concrete pump.