The utilization of a composite sorbent (NaBr and expanded graphite) in chemisorption air conditioning systems driven by low-grade heat source, and in resorption systems with simultaneous heating and cooling effects was experimentally investigated using bench-scale prototypes. The mass of ammonia desorbed and adsorbed was measured, and used to calculate the specific cooling capacity. The sorbent produced 219 kJ kg^{-1} of cooling at 5 °C and 510 kJ kg^{-1} at 15 °C, when the heat source temperature was 65 °C and the heat sink temperature was 30 °C. The air conditioning system mean specific cooling power (SCP), and mean coefficient of performance (COP) were calculated based on the desorbed and adsorbed masses, and on the variation of temperature in the reactors. For the same heat source and heat sink temperatures mentioned above, the air conditioning system had a SCP of 129 ± 7 W kg^{-1} and a COP of 0.46 ± 0.01, when cooling occurred at 15 °C. Regarding the utilization of the composite sorbent in resorption machines, the prototype was tested for production of cooling/heating at −5/50 °C, and at 10/70 °C. In the former condition, the COP was only 0.02, but in the latter condition, there was a tenfold increase in the COP, and the combined coefficient of performance and amplification reached 1.11, which indicates the energy saving potential of resorption systems using the studied sorbent.