Application and Regeneration of CuMnCeO Catalyst Supporting K₂CO₃ Sorbent Adapted to CO Oxidation and CO₂ Absorption

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Abstract : The requirement for the long-term mission of the submarine and spacecraft has made the removal of CO_2 and trace CO the critical technology to ensure the health and life of the crews. In this work, CuMnCe, a metal oxide catalyst, supporting K₂CO₃ sorbent was prepared by the wet-solid state impregnation method to realize the integrated CO and CO₂ removal, which might also reduce the volume/mass load of the purification units in the limited space. The as-prepared samples with different addition amount of K₂CO₃ were tested using the fixed bed reactor to reveal the CO oxidation and CO₂ absorption behavior. And the regeneration and stability experiments were also conducted. The results showed that the samples realized the catalyst and sorbent integration to capture CO and CO₂ at the same time. The addition amount of the sorbent had a weak influence on the CO oxidation performance. While the addition amount affected the CO₂ sorption efficiency and capacity significantly. Meanwhile, the presence of water vapor could reduce the CO oxidation activity of the samples similarly, whether with K2CO3 sorbent addition or not. Furtherly, regeneration and stability experiment results showed that the samples after 3-5 times regeneration exhibited almost the same performance of CO and CO₂ removal. Summarily, CuMnCe catalyst supporting K₂CO₃ sorbent could be a good attempt to control CO and CO₂ pollutants generated from the daily equipment running and staff breathing in the confined space such as submarine and spacecraft.

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Keywords : CO oxidation, CO2 absorptio, potassium carbonate, CuMnCe metal oxide, confined space

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