High-temperature desulfurization by ZnO/Raney CuO absorbents

1st T.-C. Wang
Department of Environmental Engineering,
National Cheng Kung University
Tainan, Taiwan
P56094157@gs.ncku.edu.tw

2nd T.-E. Wu
Department of Environmental Engineering,
National Cheng Kung University
Tainan, Taiwan
emily2738tw@gmail.com

3rd Y.-C. Tsai
Department of Environmental Engineering,
National Cheng Kung University
Tainan, Taiwan
jack1998870308@gmail.com

4th Y.-J. Tuan
Department of Environmental Engineering,
National Cheng Kung University
Tainan, Taiwan
eugenet@ncku.edu.tw

5th H. Paul Wang
Department of Environmental Engineering,
National Cheng Kung University
Tainan, Taiwan
wanghp@ncku.edu.tw

Abstract

Desulfurization of syngas containing H_2S at high temperatures for integrated gasification combined cycle is gaining momentum as a commercially viable source of clean energy. Thus, a feasibility study for hot-gas (1% H_2S) desulfurization by ZnO on skeletal Raney CuO (ZnO/R-CuO) absorbent was carried out. The degree of the hot-gas desulfurization by ZnO/R-CuO was 90.0% at 873 K and decrease to 46.5% as the temperature raised to 1073 K. The rate constant (k) for the desulfurization by ZnO/R-CuO at 873 K was 8.35×10^4 cm^3/min g with the activation energy (Ea) of 114.8 kJ/mol. Speciation of zinc and CuO in the ZnO/R-CuO for the hot-gas desulfurization was also studied by synchrotron X-ray absorption near edge structure (XANES) spectroscopy. Mainly Zn(II) and Cu(II) were found in the ZnO/R-CuO. By EXAFS, in the 2nd shells, a decrease of Cu-Cu bond distance in ZnO/R-CuO was observed during desulfurization. However, an increase in Zn-Zn bond distance was observed after desulfurization. It is apparent that hot-gas desulfurization by ZnO/Raney CuO absorbent is chemical feasible.

Keywords: *Raney CuO, ZnO, hot-gas desulfurization, EXAFS.*

IEECP'21, July 29-30, 2021, Silicon Valley, San Francisco, CA – USA
© 2021 IEECP – SCI-INDEX
D!f: *https://sci-index.com/DAI/2021.99101/IEECP/14547723*