

3rd International Conference and Expo on

OIL AND GAS

July 13-14, 2017 Berlin, Germany

Oil shale combustion under oxy-fuel conditions

Leema Abd Al-Rahman Al-Makhadmeh^{1,2}, Maier J³ and Scheffknecht G³¹Al-Hussein Bin Talal University, Jordan²Jordan University of Science and Technology, Jordan³University of Stuttgart, Germany

Direct combustion of Jordanian oil shale under oxy-fuel conditions was investigated. Unstaged and staged air-firing as well as combustion at 27% O₂/73% CO₂ (OF27) was conducted successfully. A 20 kW vertical reactor was used at a combustion temperature of 1200°C. Oil shale-N conversion rate to NO is higher during unstaged air-firing than oxy-fuel combustion; they are 27% and 15% for air-firing and OF27 combustion, respectively. NO_x emission reduced efficiently by adopting staged combustion technology under oxy-fuel conditions as well as air-firing. In addition, the reduction of simulated recycled NO has been investigated. The actual situation has been simulated by injecting NO in the reactor through the burner during OF27 combustion. The reduction of the injected NO is more efficient with staging compared to unstaged combustion mode; 100% reduction of the injected NO during staged OF27 combustion is registered while for unstaged OF27 combustion it ranges from 57% to 65%. The high sulfur content in Jordanian oil shale is considered one of the biggest challenges for its utilization. The oil shale-S conversion rate to SO₂ is lower during unstaged OF27 combustion compared to air-firing; they are 69% and 49% for air-firing and OF27 combustion, respectively. For both unstaged combustion modes, direct limestone injection at different molar Ca/S ratios has been investigated; SO₂ emissions are reduced significantly by direct limestone injection. At Ca/S molar ratio of 3, the desulfurization efficiencies are 100% and 95% for OF27 combustion and air-firing, respectively.

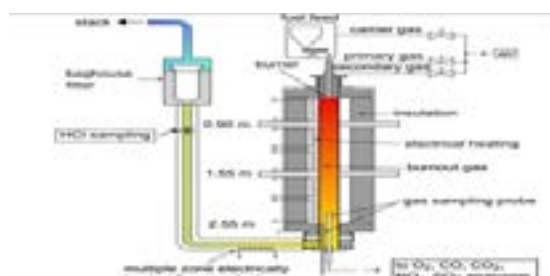


Figure-1: 20 kW Vertical Reactor.

Biography

Leema Abd Al-Rahman Al-Makhadmeh is currently working as an Associate Professor at the Department of Environmental Engineering, Al-Hussein Bin Talal University and Department of Chemical Engineering, Jordan University of Science and Technology, Jordan. She has completed her BSc and MS degrees from Jordan University of Science and Technology and PhD degree from Stuttgart University, Germany. Her research areas are oxy-fuel combustion, pyrolysis and char combustion, emission control technologies (NO_x, SO_x, PM) and others.

lamakhadmeh@just.edu.jo

Notes: