ICCES, 2023, vol.25, no.4
DOI: 10.32604/icces.2023.08826

PROCEEDINGS

Multi-physics Simulation of Tar-Rich Coal in-situ Pyrolysis in the Fractured Porous Zone with Multi-Region Homogenization Treatment

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ABSTRACT

The macroscopic tar-rich coal in-situ pyrolysis (TCISP) multi-physics simulation is conducted, in the fractured porous zone, by coupling heat transfer, fluid flow, and chemical reaction. A novel TCISP pattern of gas injection between fractured zones is proposed, by treating the fractured porous zone as a homogeneous porosity gradient descending region. In this case, nearly 11500 kg of oil can be produced within 6 months from a 10*10*1 m3 area. The influence of the fractured zone and porosity are investigated. Results indicated that gas injection between fractured zones is more conducive to rapid production, compared with the traditional case that gas injection is in the center. The temperature field is more uniform, conducive to maintaining the same reaction conditions and producing appropriate products. Inlet velocity has a positive effect on the increase of heat transfer rate, but is negative to heat transfer uniformity. There is an optimal inlet temperature of 973 K for the fastest heating rate. With the increase of temperature, the heat transfer uniformity gets worse. Increasing the height of the fractured zone is beneficial for the heating rate and heat transfer uniformity.

KEYWORDS

Tar-rich coal in-situ pyrolysis; multi-physics; fractured porous zone; heat transfer uniformity

Funding Statement: This work is supported by the Special Project of Science and Technology Energy Security Technology from China Huaneng Group (No. HNKJ20-H87-03), and the research Project of Shaanxi Provincial Coal Geology Group (No. SMDZ-2020ZD-1-03).

Conflicts of Interest: The authors declare that they have no conflicts of interest to report regarding the present study.