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Investigation on the fates of vanadium and nickel during co-gasification of petroleum coke with biomass

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Abstract: This study investigates the volatilization behaviors and mineral transformation of vanadium and nickel during co-gasification of petroleum coke with biomass. Moreover, the evolution of occurrence modes of vanadium and nickel was also determined by the method of sequential chemical extraction. The results show that the volatilities of vanadium and nickel in petroleum coke have a certain level of growth with an increase in the temperature. With the addition of biomass, their volatilities both show an obvious decrease. Organic matter and stable forms are the dominant chemical forms of vanadium and nickel. After gasification, organic-bound vanadium and nickel decompose completely and convert into other chemical forms. The crystalline phases of vanadium trioxide, coulsonite, nickel sulfide, and elemental nickel are clearly present in petroleum coke and biomass gasification ashes. When the addition of biomass reaches 60 wt.%, the diffraction peaks of orthovanadate are found while that of vanadium trioxide disappear.

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