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Thermodynamic Study on a Novel Lignite Poly-Generation System of Electricity-Gas-Tar Integrated with Pre-Drying and Pyrolysis

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7 ABSTRACT

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The efficient and clean use of lignite is strategically important to sustainable 8 development. Predrying technology is a competitive approach to solve the utilization 9 issue of the high moisture, and the pyrolysis technology is an ideal upgrading method 10 to realize high value-added components extraction. However, the two technologies are 11 normally used separately. By integrating the two technologies, the cascade utilization 12 of energy may be realized, and the utilization efficiency of lignite may be increased 13 14 accordingly. Therefore, a steam predrying coupled with lignite-pyrolysis power system (PPPS) is proposed in this paper. Theoretical models are developed on the 15 basis of thermodynamics to assess the properties of the proposed system, and a case 16 analysis is performed to determine the quantitative consequences of the PPPS. 17 Moreover, energy and exergy analyses are performed to uncover the energy saving 18 mechanism. Results indicate that the proposed system can evidently increase the 19 thermal efficiency by approximately 4.43% relatively based on the higher heating 20 value, and by approximately 4.45% relatively based on the lower heating value. The 21 PPPS can noticeably increase the exergy efficiency by approximately 4.48% 22 23 relatively owing to the integration of the lignite predrying and pyrolysis technologies.

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26 **1 Introduction**

Keywords: Lignite predrying; Pyrolysis; Integration; Energy and exergy analyses

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