# Effect of Simulated Coal Gas on Tar Production during Coal Pyrolysis

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Coal pyrolysis is one of the most important technologies to achieve the clean, efficient and comprehensive use of coal [1]. Owing to low molar ratio of hydrogen to carbon in coal, the pyrolysis tar, as an important product of coal conversion, is limited [2]. Hydropyrolysis can improve the tar yield and the quality of tar. However, high hydrogen cost limits its utilization. Coal gas, especially coke oven gas, a by-product from coking plants, contains a lot of hydrogen-rich gases, such as hydrogen and methane [3]. In order to replace hydrogen, in this paper, coal pyrolysis under simulated coal gas (SCG) was investigated. As shown in Fig. 1, the tar yield remarkably increased from 14.5 wt.% under $N_2$ to 16.6 wt.% under SCG atmosphere. To explore the effect of gas compositions in SCG on the tar yield, single-, double- or triple-components were also examined. Obviously, the gas atmospheres can improve the tar yields compared with $N_2$ atmosphere, which followed in the order of SCG > Triple-component > Double-component > Single-component > $N_2$. In comparison, CO or $CH_4$ alone has almost no effect on increasing tar yield, but when they are combined with other atmospheres, tar yield can be increased. When $CO_2$ was added, the tar yield is higher than other atmospheres under the same conditions. It is analysed that $CO_2$ as a mild oxidant could activate the reaction atmosphere. Moreover, it is noted that the decrease of char is mainly due to the presence of $H_2$. Meanwhile, when both $H_2$ and $CO_2$ were contained in the atmosphere, the yield of water increased significantly due to the reverse water gas shift reaction, which was roughly twice as high as that under $N_2$, but the addition of CO could inhibit this reaction.

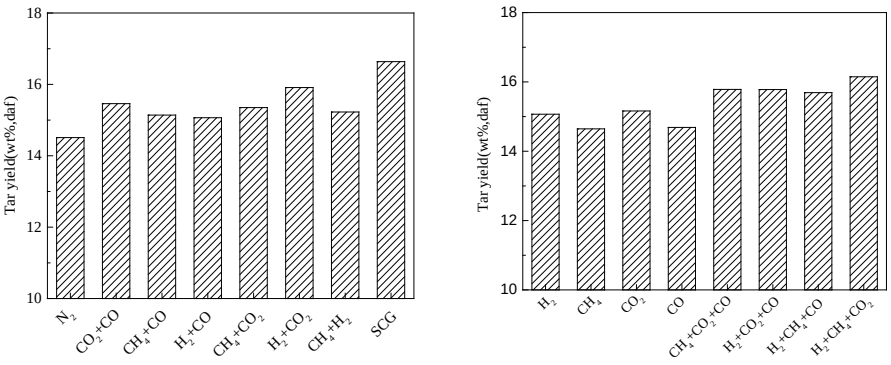


Fig. 1 Tar yield under different atmospheres (pyrolysis conditions: 650 °C, 30 min)

References

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