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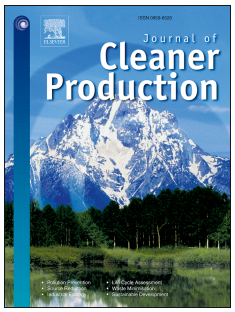


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# Life-cycle assessment for coal-based methanol production in China

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**Abstract:** More methanol is produced and used in China than in any other country. China has a great deal of coal, less oil, and little gas, so the Chinese government is enthusiastically developing the coal-based chemical industry, of which coal-based methanol production is an important part. Coal-based methanol production strongly affects the environment, so the environmental impacts of coal-based methanol production processes must be assessed. Here, two life-cycle assessment models are established using GaBi6 software, and the models and local data for coal-based methanol production are used to establish a life-cycle inventory. The environmental impacts of two typical coal-based methanol production techniques are evaluated using the CML 2001 (mid-point level) method and the Eco-indicator 99 (end-point level) models. The results indicated that less environment harm is caused by producing methanol using the coal coking technology than by producing methanol using the coal gasification technology, especially in terms of acidification, global warming, and photochemical oxidation. In particular, significantly less environmental harm in terms of climate change and radiation is caused by the coal coking technology than by the coal gasification technology. Different sub-processes clearly make different contributions to environmental harm. The results indicated that the methanol production process, heating, and desalination are the main sources of environmental harm for both the coal gasification technology and coal coking technology. Importantly, the public engineering process rather than the methanol production process itself was found to determine emissions for the different methanol production methods.

*Keywords:*
Coal-based methanol production
Coal gasification technology (CGT)
Coal coking technology (CCT)
Life-cycle assessment (LCA)
China

**Highlights:**

1. A comparative LCA for coal-based methanol production was conducted.
2. The LCI for coal-based methanol based on site-specific investigations was proposed.
3. The impacts of two coal-based methanol production techniques were analyzed.
4. Potential policy implications to lower the related impacts were identified.

*Abbreviations:* CGT, Coal gasification technology; CCT, Coal coking technology; COG, Coke