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**Influence of Inherent Hierarchical Porous Char with Alkali and
Alkaline Earth Metallic Species on Lignin Pyrolysis**

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Highlights

- AAEMs-loaded char was prepared by in situ pyrolysis of alkali and alkaline earth metals (AAEMs)-impregnated lignin.
- Char morphology and pyrolysis product distribution were affected by AAEMs.
- A catalytic strategy was implemented to investigate volatile-char interactions based on ex situ lignin pyrolysis.
- Significant volatile-char interactions during lignin pyrolysis was confirmed.
- Alkali metals (Na, K) exhibited a greater enhancement on char reactivity compared with alkaline earth metals (Ca, Mg).

Graphical abstract

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