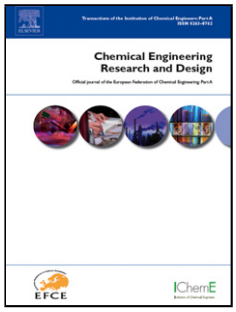

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Development and Application of an Electric Vehicles Life-cycle Energy Consumption and Greenhouse Gas Emissions Analysis Model

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Research highlights

- An expandable model is developed for EV life-cycle GHG emissions analysis globally.
- GHG emissions of EV in 6 countries are studied considering geographical difference.
- GHG emissions reduction (GER) rates of EVs are highly variable geographically.
- EVs can achieve higher GER with low-carbon electricity development in future China.

Abstract: An expandable electric vehicle (EV) life-cycle analysis (LCA) model (EV-LCA) is developed to analyze the life cycle (LC) energy consumption (EC) and greenhouse gas (GHG) emissions of EVs considering variations in electricity grid mix and vehicle energy efficiency performance. Employing EV-LCA as a common model platform, a case study is conducted to assess the LC GHG emissions of an average passenger battery electric vehicle (BEV) and plug-in hybrid electric vehicle (PHEV) with a comparative internal combustion engine vehicle (ICEV) under real-world driving conditions in China, the U.S., Japan, Canada and EU, based on country-specific data. The model is shown to be applicable and flexible to assess the average EC and GHG emissions performance of EVs at both regional and national level under large-scale adoption. The case study indicates that currently BEVs show a positive