

# Utilization of biochar derived from waste railway sleeper

S.Y. Kim, H.B. Kim, K. Baek

Department of Environment and Energy, Jeonbuk National University, Jeonju-si, Jeollabuk-do, 54896, Republic of Korea

Keywords: Railway sleeper, Pyrolysis, Biochar, Adsorption  
Presenting author email: suyeon716@nate.com

Sleeper is a supporter for rails in railway tracks, most of the sleepers were made from hardwood, and the wood should be impregnated with creosote or toxic heavy metals to prevent corrosion in the environment. However, wood railway sleepers have several disadvantages such as short lifetime (25-30 years) and high maintenance cost. Additionally, the creosote causes serious environmental pollution (Vilniskis, 2018). Consequently, wood railway sleepers are being replaced with concrete railway sleeper to complement the wood's weakness. Even in Korea, 22,500 m<sup>3</sup> of waste railway sleepers are generated annually. The waste wood railway sleepers has been incinerated to treat completely creosote (Zhurinsh, 2005), and incineration can recover thermal energy from the waste sleeper. Pyrolysis can recover the creosote from the sleeper, and produce syngas and char as well as treat the toxic solid waste. The pyrolysis residue called biochar has various physicochemical properties including large specific surface area, porous structure, and surface functional groups, which can be effectively utilized as an adsorbent (Dai, 2019). Therefore, in this study, railway sleeper-derived biochar was applied to remove dye from textile industrial wastewater (e.g. congo red and methylene blue). To investigate its potential application as adsorbent, physicochemical properties and dye adsorption efficiency of railway sleeper-derived biochar were evaluated.

## Acknowledgement

This research was supported by Korea Railway Research Institute, and supported partially by Korea Ministry of Environment (MOE) as Knowledge-based environmental service (Waste to energy) Human resource development Project (grant number; YL-WE-18-002), BK21 Four program (Jeonbuk National University – Department of Environment and Energy - Environmental Education and Research Center for Global Resources Circulation).

## Reference

- [1] R. Vilniskis, R. Vaiskunaite, Complex contamination research and hazard assessment of the waste of the wooden railway sleeper, *Baltic J. Road Bridge Eng.* 13, 385-403 (2018)
- [2] Y. Dai, N. Zhang, C. Xing, Q. Cui, Q. Sun, The adsorption, regeneration and engineering applications of biochar for removal organic pollutants: A review, *Chemosphere* 223, 12-27 (2019)
- [3] A. Zhurinsh, J. Zandersons, G. Dobeles, Slow pyrolysis studies for utilization of impregnated waste timber materials, *J. Anal. Appl. Pyrolysis* 74, 439-444 (2005)