# Characterization and TCE Adsorption Capacities of Biochars Derived from a Variety of Feedstock

(다양한 폐자원으로부터 생산된 Biochar의 특성 및 TCE 흡착능 평가)

**Mahtab Ahmad · Sang Soo Lee · Yong Sik Ok***

Mahtab Ahmad · 이상수 · 옥용식*

Department of Biological Environment, Kangwon National University, Chuncheon 200-701, Korea

강원대학교 바이오자원환경학과

Behavior, transport and fate of biochar (BC) in the environment are largely controlled by the feedstock quality and pyrolysis conditions. Heterogeneous properties of BC mainly determine its use in proper or particular ways. We synthesized BC from a variety of feedstock, including coconut shell, peanut shell, soybean stover and poultry waste. Effect of temperature on BC properties was also evaluated. Carbonization of the selected feedstocks was performed at a heating rate of 7℃ $min^{-1}$, indicating moderate pyrolysis conditions. Adsorption capacities of each BC were tested for trichloroethylene (TCE) in aqueous solutions. Our results showed that BC yield was depending on the type of feedstock and temperature conditions during the pyrolysis process. The yield of BC from poultry waste resulted in a maximum yield of 49.8% that was related to its higher inorganic contents as indicated by higher ash contents (30.2%). Resident matter, which determines the recalcitrant nature of BC, was higher (67.7%) in BC derived from soybean stover at 700℃. High temperature during pyrolysis also resulted in producing BC with high pH value (11.32). Total carbon contents ranged from 45.5% and 74.4% in BCs derived from poultry waste at 300℃ and soybean stover at 700℃, respectively. However, labile carbon content was higher (44.3%) in BC derived from peanut shell at 300℃, and resident carbon contents were maximum (61.2%) in BC derived from soybean stover at 700℃. Exchangeable cations and cation exchangeable capacities were higher in BCs derived from poultry waste and soybean stover, respectively. The TCE removal rate from aqueous solutions varied by different types of BC owned to their different chemical properties. Our results clearly indicated that type of feedstock and pyrolysis conditions greatly affect the BC qualities or properties. We suggest that before applying BC to solid phase (for soil remediation) or liquid phase (for water treatment), the characteristics of BC according to feedstock quality or pyrolysis conditions should be considered. The study was supported by Ministry of Environment as “The GAIA project (No. 173-092-010)”.

**Keywords :** Biochar, Recalcitrant carbon, Feedstock, Carbonization, Trichloroethylene

**Corresponding author :** E-mail. soilok@kangwon.ac.kr; Tel. 82-033-250-6443