

Enhanced extraction of PAHs from fly ashes with variable dielectric-constant supercritical fluids

1st K.-A. Hsueh

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
iomikilove@gmail.com

2nd Y.-C. Tsai

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
jack1998870308@gmail.com

3rd T.-E. Wu

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
emily2738tw@gmail.com

4th I.-H. Chen

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
hermosa2336@gmail.com

5th Y.-J. Tuan

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
eugenet@ncku.edu.tw

6th H.-P. Wang

Department of Environmental
Engineering
National Cheng Kung University
Tainan, Taiwan
wanghp@ncku.edu.tw

Abstract

There is a lack of quality data on the levels of polycyclic aromatic hydrocarbons (PAHs) in incineration fly ashes primarily due to the conventional Soxhlet extraction fails by the recovery of PAHs during the process. To better understand the hindered PAH finger-print patterns in the fly ashes, extractions with supercritical fluids (SCFs) such as dichloromethane (SDCM) ($T_c=333$ K and $P_c=248$ bar), water (SCW) ($T_c=673$ K and $P_c=240$ bar), and CO_2 (SCCO₂) ($T_c=333$ K and $P_c=248$ bar) were studied. By adjusting the dielectric constant (ϵ) of the supercritical fluids and mixtures, moderate-to-low polarity PAHs in the fly ashes can be extracted. Virtually most of PAHs hindered in fly ashes can be quantitatively extracted with the supercritical fluids at a wide range of ϵ . Moreover, the adjustable- ϵ SCF method developed in this work may have promising applications in the analysis of deuterated-PAHs embedded in interplanetary dusts.

Keywords: PAHs, supercritical dichloromethane, supercritical water, supercritical fluids.