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Effect of Irradiation Energy and Residence Time on Decomposition Efficiency of Polycyclic Aromatic Hydrocarbons (PAHs) from Rubber Wood Combustion Emission Using Soft X-rays



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1 **Effect of Irradiation Energy and Residence Time on Decomposition**  
2 **Efficiency of Polycyclic Aromatic Hydrocarbons (PAHs) from**  
3 **Rubber Wood Combustion Emission Using Soft X-rays**

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14  
15 **Abstract**

16  
17 This research aims to investigate the effects of irradiation energy and residence time of soft  
18 X-ray irradiation in the decomposition of sixteen polycyclic aromatic hydrocarbons (PAHs) in  
19 smoke particles emitted from the Para rubber wood burning. The burning process was carried out  
20 in a tube furnace and the soft X-ray radiation used had a wave length of 0.13–0.41 nm. The  
21 irradiated (IR) and non irradiated (N-IR) smoke particles were collected simultaneously using a  
22 10-stage Andersen sampler equipped with an inertial-filter stage (ANIF), in order to determine  
23 the physicochemical characteristic of both IR and N-IR smoke particles, including its size  
24 distribution, particle concentration, and particle-bound PAHs concentration. Results show that the  
25 nano-size smoke particles contained the highest amount of PAHs and of carcinogenic potency  
26 equivalent (BaP-TEQ). About 75% of PAH compounds on the total smoke particle were  
27 decomposed at the highest irradiation energy. Moreover, 4-6 ring PAHs in nanoparticles (<70  
28 nm) were decomposed of up to about 91% at the highest irradiation energy. The decomposition  
29 efficiency of PAHs was influenced by particle size, PAHs boiling temperature and irradiation  
30 energy. It was higher for PAHs with lower boiling temperature and smaller size particles, while  
31 the effect of residence time was not significant.

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33 **Keywords:** Soft X-rays, PAH decomposition, Rubber wood, Biomass combustion, Nanoparticles.  
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