

**Title :** Design a Simple Experimental Setup for Measuring Light Absorption of Brown Carbon (BrC) in PM 2.5 Samples During the Smoke Haze Season in Chiang Mai

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## ABSTRACT

This research aims to design a simple, cost-effective device using accessible materials and 3D printing to enhance durability in measuring Brown Carbon (BrC) absorption. Particulate matter less than 2.5 microns in diameter (PM<sub>2.5</sub>) samples were collected during March–April 2021. BrC was extracted by soaking in water and methanol to isolate the BrC dissolved in both solvents for analysis. The study compared measurement methods between a UV-Vis spectrophotometer and a self-developed spectroscopy device, using Beer-Lambert's law to calculate BrC absorption values. Preliminary tests showed that the BrC absorption value measured by the self-developed device was  $0.640 \pm 0.317$ , while the UV-Vis spectrophotometer measured  $0.601 \pm 0.296$ . The BrC concentration from the self-developed device was  $1.10 \times 10^{-4}$  mg/L, compared to  $1.04 \times 10^{-4}$  mg/L from the UV-Vis spectrophotometer. Pearson correlation analysis indicated a strong positive correlation ( $r = 0.951$ ) between the absorption values measured by the two methods. Performance evaluation revealed a limit of detection (LOD) of 0.083, a limit of quantification (LOQ) of 0.279, and a relative standard deviation (%RSD) of 1.99%. Statistical analysis showed no significant difference in variance between the two groups ( $p > 0.05$ ). Continuous testing for 6 hours a day over 15 days confirmed the device's stability and accuracy in measuring light absorption.

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