ABSTRACT

Bandung Raya has a unique topography. It is surrounded by mountains forming a basin which results in pollutant trappings. Besides conventional instruments such as TEOM which is pricy, low-cost sensors are often used as an alternative to detect pollutant particles of PM10 to PM1.0 because of their relatively lower cost and portable size. However, low cost sensors have a disadvantage of being unable to detect particles smaller than 0.3µm. This study aims to build a low cost portable instrument that is able to detect the presence of PM2.5 up to 0.1 µm. The instrument consists of a 405 nm NWM-960448 laser diode and a PDA25K photodetector that is able to detect light at wavelengths from 150-550 nm and has a gain variation of 0-70 dB. The laser light that collides with particles <1 µm is scattered and captured by the photodetector. The photodetector output is voltage which is then converted to a particle mass concentration. There are two measurement conditions that are carried out, namely when the air environment is clean without any pollutant particles (Clean Air) and when the open air environment has pollutant particles (Ambient Air). Clean Air measurement utilizes a clean pump, HEPA filter, chamber and SKU SEN0177 to obtain the clean air conditions. Ambient air measurement uses SKU SEN0177 to compare the measurement results. The Clean Air measurement resulting a linear data value y = 0.1994 (x) - 273.2 which is used to convert voltage to mass concentration Ambient Air measurements were carried out in two places, indoors and outdoors. The indoor test shows that the measuring instrument has a trend that is quite similar as SKU SEN0177. The reading of the test equipment begins to be inaccurate when the mass concentration of the particles is above 60 $\mu g/m^3$. Inaccurate measurement is due to the un-optimal flow-rate of pump.

Keywords: air quality, laser diode, low-cost sensor, photodetektor, $PM_{2.5}$