

DEVELOPMENT OF CARBON NANODOTS IN ESSENTIAL CAJUPUT OIL FOR POTENTIAL ANTI-BACTERIAL AGENTS

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ABSTRACT

This research aimed (1) to synthesize C-dots and C-dots/cajuput oil (C-dots/CO) made from CO distillation waste, (2) to characterize C-dots and C-dots/CO made from CO distillation waste based on PL, TRPL, UV-Vis, FTIR, and TEM tests, and also (3) to apply C-dots and C-dots/CO as antibacterial agents against *E. coli* bacteria based on antibacterial tests. This research was divided in three steps, i.e.: synthesis, characterization, and application. This research began by synthesizing C-dots powder made from CO distillery wastes. The C-dots powder was then dissolved to become C-dots stock solution. The stock solution of C-dots was characterized by PL to find out the C-dots emission, TRPL to find out the decay time of C-dots, UV-Vis to determine the absorbance of C-dots, FTIR test to identify the functional groups contained in the C-dots, and TEM test to determine the morphology and size of C-dots. After characterization, the C-dots were mixed with CO and Tween-80 until C-dots/CO was obtained with volume variation. After that, the mixture was characterized using UV-Vis and FTIR. The C-dots, C-dots/CO, and CO were tested for their antibacterial properties against *E. coli* bacteria. The results showed that the emission peak of the C-dots was at wavelength of 500 nm to 520 nm resulting in cyan-colored luminescence. This PL test was also supported by the TRPL test that showed the decay time of C-dots in range of 4 ns - 20 ns, which was the decay time of C-dots. The UV-Vis test showed peaks of absorbance at wavelength 214 nm – 216 nm. Meanwhile, the FTIR test indicated functional groups of C-dots, i.e.: C=C, C-H, and O-H, which showed the bonds of C-dots at the core and surface state. The TEM test showed that the C-dots size was in the range of 2.98 nm to 3.24 nm. Moreover, UV-Vis and FTIR tests also revealed that C-dots/CO has absorbance peaks at wavelengths of 232.5 nm and 272.5 nm, and also functional groups, i.e.: C=C, C-O, C=O, O-H, -CH₂, and -CH₃. Based on the antibacterial test, the mixture has a high inhibition zone of 2.73 mm to 3,6 mm. On the other hand, CO has the longest effective time to inhibit bacteria up to 24 hours.

Kata Kunci: C-dots, distillery waste, CO, antibacterial, *E. coli*, C-dots/CO