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Article

Fabrication, Characterization and Photocatalytic Activity of Copper Oxide Nanowires Formed by Anodization of Copper Foams

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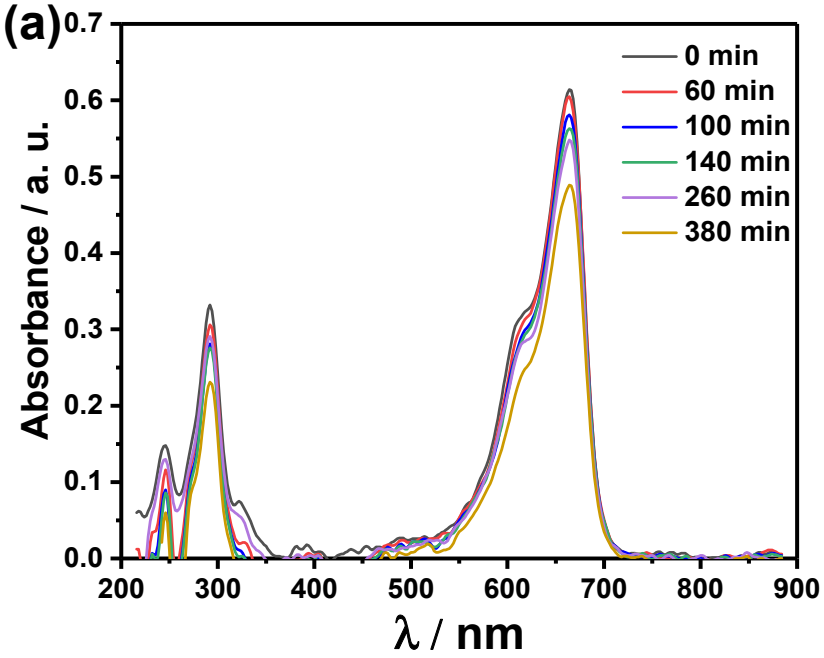
Keywords: copper oxides; anodization; nanowires; FTIR; photocatalytic decolorization; nanostructures; tenorite; cuprite; paramelconite; malachite



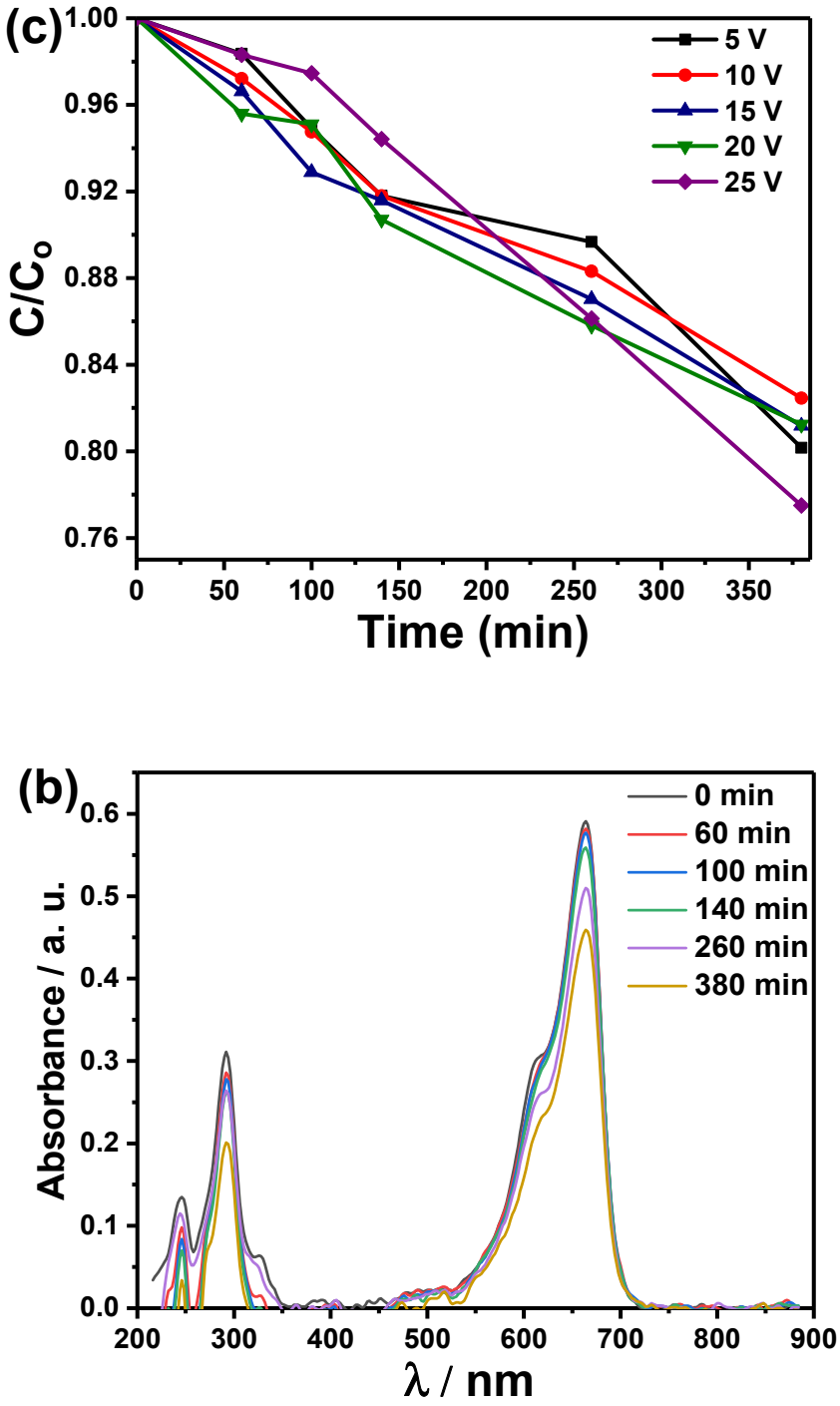


Figure S1. The optical absorbance spectra of MB at various periods of irradiation to the ultraviolet irradiation using anodized copper foam in 0.1 M K_2CO_3 at (**a**) 5, and (**b**) 25 V as a catalyst, and (**c**) rate of MB dye photodegradation with anodized copper foam as catalysts.

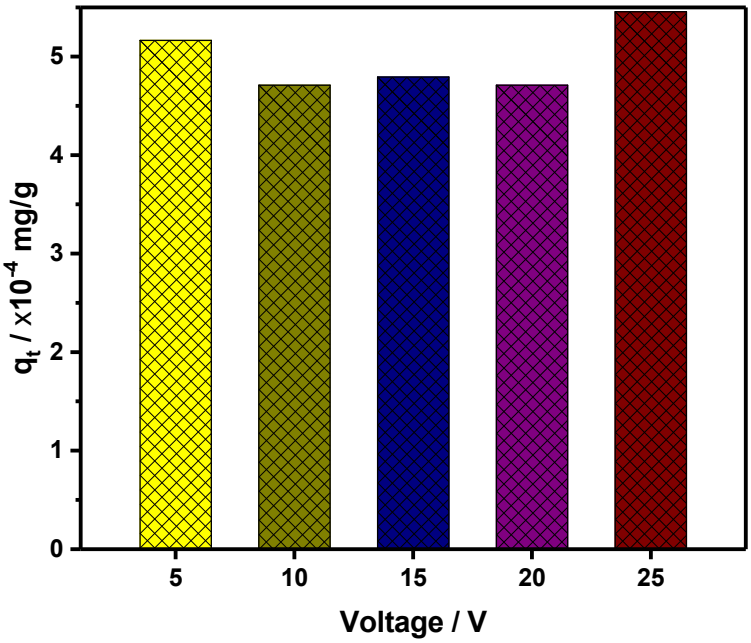


Figure S2. Histogram plot shows the adsorption capacity (q_t) of methylene blue (MB) using anodized copper foam in 0.1 M K_2CO_3 at various anodizing voltages 5, 10, 15, 20, 25, and 25 V as a catalyst after irradiation for 380 min.

Figure S3 illustrates the pseudo-second-order kinetic model for MB degradation on the copper oxide nanostructures. It illustrates a linear plot for the relation of $\frac{t}{q_t}$ versus t. The fitting correlation coefficients (R^2) for the applied pseudo-second-order kinetic for copper foams anodized at 5, 10, 15, 20, and 25 V are equals 0.20, 0.82, 0.58, 0.27, and 0.78, respectively. From the intercept of the fitted lines, the value of K_2 is obtained and changed between 0.41-5.79 g/mg·min and is listed for various copper oxide samples in **Table 1**. The maximum and minimum value of K_2 was for copper foams anodized at 25, and 20 V, respectively. Furthermore, the values of q_e were calculated for MB degradation using the copper oxide nanostructured were calculated from the slope of the fitted line in **Figure S3** and listed in **Table 1**.

The relation between q_t and $\sqrt{t}$, for the degradation process for MB using copper oxide nanostructured is shown in **Figure S4**. It illustrates a linear plot for the relation of q_t and $\sqrt{t}$. The fitting correlation coefficients (R^2) for the applied intra-particle diffusion kinetic model for copper foams anodized at 5, 10, 15, 20, and 25 V are equals 0.92, 0.98, 0.98, 0.94, and 0.95, respectively. From the obtained and fitted line, we have calculated both the values of $K_{diff.}$ and C for copper oxide nanostructures. The maximum estimated values of $K_{diff.}$ and C are 3.72×10^{-5} mg/min$^{1/2}$g, and -2.85×10^{-4}, respectively, and they were observed for adsorption of MB onto copper foams anodized at 25 V. These values for other investigated samples are listed in **Table 1**.

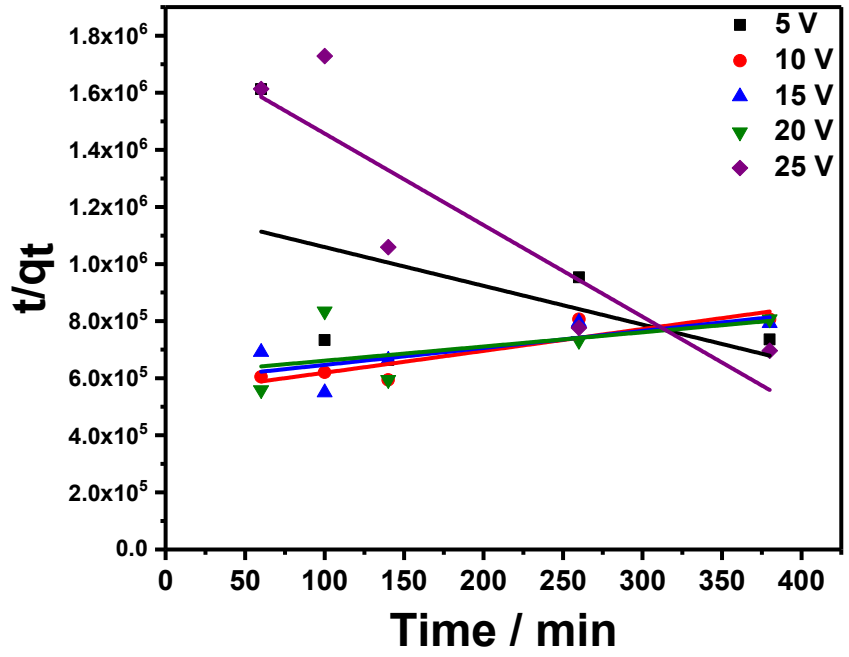


Figure S3. Pseudo-second-order kinetic model for adsorption of methylene blue (MB) using anodized copper foam in 0.1 M K_2CO_3 at 5, 10, 15, 20, 25, and 25 V as a catalyst.

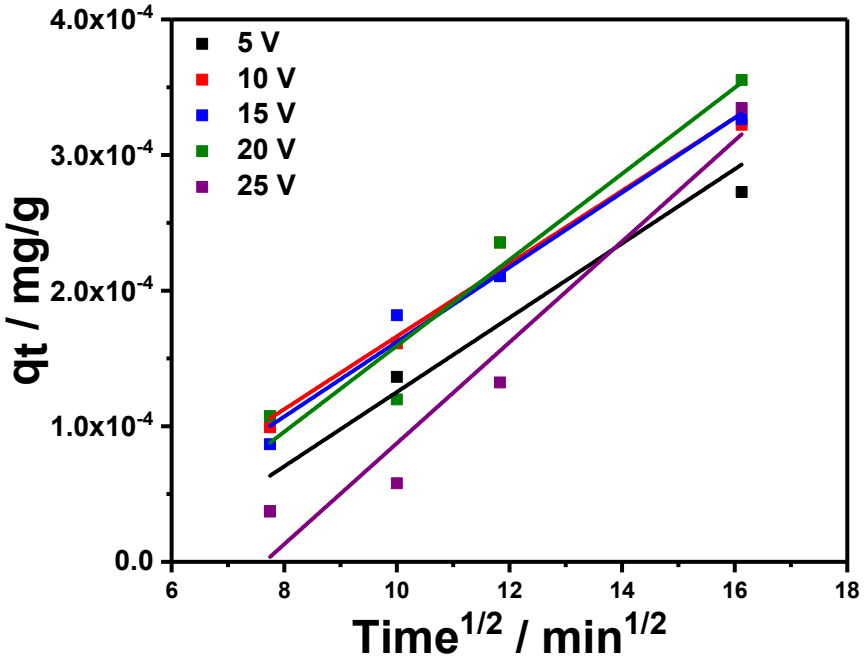


Figure S4. Intra-particle diffusion model for adsorption of methylene blue (MB) using anodized copper foam in 0.1 M K_2CO_3 at 5, 10, 15, 20, 25, and 25 V as a catalyst.