ABSTRAK

Degradasi zat warna metilen biru dilakukan melalui metode fotokatalisis dengan katalis $BiVO_4$ dan bantuan sinar visibel. Untuk menegetahui karakteristik dan meningkatnyan aktivitas fotokatalitiknya, desain fotokatalis $BiVO_4$ dilakukan melalui variasi nilai pH sintesis, suhu kalsinasi, dan pH metilen biru. Pengukuran laju kinetika reaksi dan mekanisme degradasi fotokataltik juga dilakukan dalam penelitian ini. Karakterisasi material yang dilakukan diantaranya pengamatan data XRD, citra SEM, dan UV-Vis DRS. Berdasarkan data, sintesis kopresipitasi dapat dipakai untuk menyintesis $BiVO_4$ dengan kritstalinitas yang cukup baik. Variasi BiV(4)(400) dengan karakteristik monoklinik scheelite, citra SEM *spheric-like*, dan energi celah pita sebesar 2,46 eV memiliki aktivitas fotokatalitik yang baik. BiV(4)(400) memiliki laju kinetika degradasi sebesar 0,0125 menit^{-1} dengan persen degradasi fotokatalitik sebesar 74,56% dan degradasi total sebesar 88,45%. Waktu degradasi optimum adalah sebesar 180 menit, dengan kondisi penyinaran visibel, dan pH larutan sebesar 11. Tidak sempurnanya presentase degradasi diduga disebabkan oleh kinerja ROS digunakan untuk mendegradasi lebih lanjut *intermediet* metilen biru yang terbentuk dan adanya kemungkinan terjadinya rekombinasi elektron dan *hole* pada material. Berdasarkan data, spesi radikal dominan dalam aktivitas fotokatalitik $BiVO_4$ yaitu radikal OH^* dan O_2^{-*}.

Kata kunci: bismut vanadat, kopresipitasi, metilen biru, desain fotokatalis, adsorpsi

ABSTRACT

The degradation of methylene blue dye was carried out by means of photocatalytic method with $BiVO_4$ catalyst and the help of visible light. To determine the characteristics and increase in photocatalytic activity, the design of the $BiVO_4$ photocatalyst was carried out by varying the synthesis pH value, calcination temperature, and pH of methylene blue. Measurements of the rate of reaction kinetics and the mechanism of photocatalytic degradation were also carried out in this study. Material characterization carried out included observations of XRD data, SEM images, and UV-Vis DRS. Based on the data, coprecipitation synthesis can be used to synthesize $BiVO_4$ with high enough crystallinity. Variation of BiV(4)(400) with scheelite monoclinic characteristics, spheric-like SEM image, and band gap energy of 2.46 eV has good photocatalytic activity. BiV(4)(400) has a degradation kinetics rate of 0.0125 min^{-1} with a photocatalytic degradation percentage of 74.56% and a total degradation of 88.45%. The optimum degradation time was 180 minutes, with visible light conditions, and the pH of the solution was 11. The incomplete degradation percentage was thought to be caused by the performance of ROS used to further degrade the methylene blue intermediate formed and the possibility of electron and hole recombination in the material. Based on the data, the dominant radical species in the photocatalytic activity of $BiVO_4$ are OH^* and O_2^{-*} radicals.

***Keywords**: bismuth vanadate, coprecipitation, methylene blue, photocatalyst design, adsorption*