Sintesis metal organic framework (MOF) La-PTC dan aplikasinya sebagai fotokatalis dalam degradasi zat warna di bawah iradiasi cahaya tampak = Synthesize of metal organic framework (MOF) La-PTC and its application as photocatalyst for dyes degradation under visible light irradiation.

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Abstrak

Metal organic framework (MOF) La-PTC berbasis ligan perylene dan logam lantanum disintesis menggunakan metode solvotermal pada suhu 170 °C selama waktu reaksi 24 jam dengan menggunakan pelarut campuran air dan DMF sebanyak 30 mL dengan perbandingan 5:1. MOF La-PTC memiliki karakteristik yang berbeda degan senyawa prekursornya Na4PTC. La-PTC yaitu memiliki nilai energi celah pita 2,25 eV, luas area permukaan 22,2364 m2/g, total volume pori sebesar 0,0685 cm3/g dan ukuran pori 12,3291 nm. Hasil analisis SEM-EDS La-PTC memiliki kandungan atom karbon sebesar 51,8%; oksigen sebesar 28,3% dan lantanum sebesar 19,9%. MOF La-PTC juga memiliki stabilitas termal hingga temperatur 376,27 °C. MOF La-PTC memiliki daya adsorpsi sebesar 22,72%, and 29.70% selama waktu diseprsi 60 menit. MOF La-PTC memiliki aktivitas fotokatalitik terhadap degradasi metil jingga dengan persen efisiensi degradasi sebesar 64,76%, tetapi tidak untuk metilen biru. Penambahan H2O2 meningkatkan aktivitas fotokatalitik MOF La-PTC terhadap degradasi metil orange menjadi 99,60% dan metilen biru menjadi 67,02% dengan waktu penyinaran sinar tampak selama 240 menit. MOF La-PTC dapat digunakan untuk mendegradasi metil jingga sebanyak tiga kali siklus reaksi dengan persen efisiensi degradasi sebesar 62,57% dan metilen biru sebanyak 4 siklus reaksi dengan persen efisiensi degradasi sebesar 77,61% dengan adanya H2O2 dalam sistem.
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Metal organic framework of lanthanum and perylene ligand was successfully synthesized by solvothermal method. Therefore this study aims to assess the photocatalytic activity of La-PTC metal organic framework, in degradation of methylene blue and methyl under visible light irradiation. The results of the FTIR characterization showed that, MOF La-PTC had a different structure and composition from its precursor (Na4PTC). The MOF La-PTC has a band gap energy value of 2.25 eV and a surface area of 22.2364 m2/g. The SEM-EDS analysis showed an elemental composition of lanthanum, carbon, and oxygen, as 19.9%, 51.8%, and 28.3%, respectively. LMOF La-PTC had good thermal stability up to 376.27 °C. Furthermore, MOF La-PTC was able to adsorb dyes at the optimum degradation efficiency of 22.72%, and 29.70% for MB and MO at the dispersion period of 60 minutes. MOF La- PTC has photo-catalytic activity towards the degradation of methyl orange with the degradation efficienty of 64.26%, in contrast to methylene blue, which do not have this potential under visible light irradiation. The addition of H2O2 to the mixture, caused the increasing of La-PTC photo-catalytic activity from 64.76% to 99.60% for MO and 8.44% to 67.02% for MB. MOF La-PTC degrade methylene blue for four cycles reaction with percent degradation efficiency of 77.61% and three cycles reaction for methyl orange with percent degradation efficiency of 62.57%. Therefore, MOF La-PTC possess the potential of a photo-catalyst material in degrading dyes, under visible

light irradiation.