

SINTESIS SENYAWA BENZOTIAZOL PIRAZOLINA BERBASIS 2-ASETILPIRIDIN SERTA UJI AKTIVITAS DAN SELEKTIVITASNYA SEBAGAI KEMOSENSOR FLUORESENS ION BESI (III)

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INTISARI

Sintesis senyawa benzotiazol pirazolina berbasis 2-asetilpiridin serta uji aktivitas dan selektivitasnya sebagai kemosensor fluoresens ion besi (III) telah dilakukan. Penelitian ini terdiri dari beberapa tahap yaitu: (a) sintesis senyawa kalkon dari 2-asetilpiridin dan 2,4-dimetoksibenzaldehida menggunakan metode sonokimia, (b) siklisasi senyawa kalkon menggunakan metode sonokimia dan (c) uji aktivitas dan selektivitas senyawa pirazolina sebagai kemosensor fluoresens ion besi (III).

Senyawa kalkon diperoleh dari reaksi kondensasi Claisen-Schmidt antara 2,4-dimetoksibenzaldehida dengan 2-asetilpiridin dengan katalis basa KOH, sedangkan senyawa pirazolina diperoleh dari reaksi senyawa kalkon dengan 2-hidrazinobenzotiazol dalam kondisi basa. Proses sintesis senyawa kalkon dan pirazolina dilakukan dengan metode sonikasi dan dimurnikan dengan metode rekristalisasi. Senyawa kalkon dan pirazolina dikarakterisasi dengan spectrometer FTIR, $^1\text{H-NMR}$, $^{13}\text{C-NMR}$, dan GC-MS. Kemampuan kemosensor fluoresensi dari senyawa pirazolina terhadap ion Fe^{3+} diuji dengan serangkaian proses skrining kation, penentuan LOD (*limit of detection*), LOQ (*limit of quantification*), uji interferensi dan penentuan nilai *quantum yield*.

Sintesis kalkon menghasilkan padatan berwarna hijau dengan rendemen hasil sintesis sebesar 88,52%, kemurnian 98,31% dan titik leleh 139,6-141,6 °C. Senyawa pirazolina dari reaksi siklokondensasi berwujud padatan berwarna putih gading dengan rendemen sebesar 91,35% dan titik leleh 187-189 °C. Aktivitas kemosensor dari senyawa pirazolina menunjukkan adanya pemadaman sifat fluoresensi dengan keberadaan ion Fe^{3+} . Nilai LOD dan LOQ yang diperoleh berturut-turut sebesar 18,58 μM dan 56,30 μM disertai dengan hasil uji interferensi yang cukup baik menunjukkan senyawa pirazolina ini cukup selektif terhadap ion Fe^{3+} . Nilai *quantum yield* yang diperoleh sangat tinggi yaitu sebesar 0,93 menggunakan senyawa rhodamine B sebagai acuan. Senyawa pirazolina memiliki potensi yang sangat baik sebagai kemosensor ion Fe^{3+} .

Kata kunci: Fluoresens, kemosenor, besi (III) dan Pirazolina.

***SYNTHESIS OF A BENZOTHAZOLE-PYRAZOLINE BASED ON 2-
ACETILPYRIDINE ALONG WITH ITS ACTIVITY AND SELECTIVITY ASSAY
AS IRON (III) ION FLUORESCENT CHEMOSENSOR***

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ABSTRACT

The synthesis of benzothiazole-pyrazoline based on 2-acetylpyridine along with its activity and selectivity assay as iron (III) ion fluorescent chemosensor, has been conducted. The aim of this research was to synthesize chalcone compounds from 2-acetylpyridine and 2,4-dimethoxybenzaldehyde using sonochemical methods, synthesize pyrazoline compounds from the synthesized chalcone compound using sonochemical methods, and perform activity and selectivity testing of the pyrazoline compound as a fluorescence chemosensor for iron (III) ions.

The chalcone compound was obtained through a Claisen-Schmidt condensation reaction between 2,4-dimethoxybenzaldehyde and 2-acetylpyridine using a base catalyst. The pyrazoline compound was obtained from the synthesized chalcone compound using 2-hydrazinobenzothiazole in a cyclization reaction. The synthesis processes of both chalcone and pyrazoline compounds were carried out using sonochemical methods and purified by recrystallization. The chalcone and pyrazoline compounds were characterized using FTIR, ^1H NMR, ^{13}C NMR, and GC-MS. The fluorescence chemosensing ability of the pyrazoline compound towards Fe^{3+} ions was tested through a series of cation screening processes, determination of LOD (limit of detection) and LOQ (limit of quantification), interference tests, and determination of the quantum yield value.

The research results showed that the chalcone compound is a green solid with a yield of 88.52%, purity of 98.31%, and melting point in the range of 139.6-141.6 °C. The pyrazoline compound obtained from the cyclization reaction appeared as a broken white solid with a yield of 91.35%, high purity, and melting point of 187-189 °C. The chemosensing activity of the pyrazoline compound exhibited fluorescence quenching in the presence of Fe^{3+} ions. The obtained LOD and LOQ values were 18.58 μM and 56.30 μM , respectively, accompanied by satisfactory interference test results, indicating the sufficient selectivity of the pyrazoline compound towards Fe^{3+} ions. The quantum yield value obtained was very high, at 0.93, using rhodamine B as a reference compound.

Key words: Chemosensor, fluorescence, iron (III), and pyrazoline.