UNIVERSITAS
GADJAH MADA
Sintesis Kemosensor Azina Asimetris Hibrida vanilinâ€“p-nitrobenzaldehida dan Vanilinâ€“p-nitrosinamaldehida
Maria Lilita Guterres, Prof. Drs. Bambang Purwono, M.Sc., Ph.D.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

SINTESIS KEMOSENSOR AZINA ASIMETRIS HIBRIDA VANILIN–p-NITROBENZALDEHIDA DAN VANILIN–p-NITROSINAMALDEHIDA

Maria lilita Guterres
24/540026/PPA/06808

INTISARI

Telah disintesis dua senyawa kemosensor kolorimetri berbasis azina hibrida, yaitu hibrida p-nitrobenzaldehid-vanilin-azina (p-NBVA) dan p-nitrosinamaldehid-vanilin azina (p-NCVA). Penambahan satu unit gugus vinil pada p-NCVA dilakukan dengan tujuan memperpanjang π-konjugasi dan meningkatkan proses *intramolecular charge transfer* (ICT). Sintesis dilakukan menggunakan metode kondensasi basa Schiff berbasis sonokimia melalui dua jalur reaksi, yaitu hidrolisis azina simetris VA dan jalur intermediet hidrazon dari p-nitrobenzaldehida dan p-nitrosinamaldehida. Jalur sintesis hidrazon berhasil meningkatkan rendemen dan kemurnian produk. Struktur senyawa hasil sintesis dikarakterisasi menggunakan FT-IR, ATR-IR, GC-MS, LC-MS, UV-Vis, serta ^{1}H- dan ^{13}C-NMR. Kinerja kemosensor dievaluasi melalui studi solvatokromik, ionikromik, interferensi, waktu respon, reversibilitas, dan *host guest* dengan analisis ^{1}H-NMR, serta aplikasi pada sampel nyata.

Studi solvatokromik menunjukkan pergeseran bathokromik hingga 170 nm seiring peningkatan polaritas pelarut. Uji ionokromik dan interferensi menunjukkan kemosensor selektif terhadap CN^- berdasarkan perubahan warna serta pergeseran spektrum UV-Vis dalam pelarut DMF. Uji waktu interaksi kemosensor menunjukkan bahwa p-NBVA memberikan respons deteksi CN^- yang lebih cepat, sedangkan p-NCVA memiliki kestabilan sinyal yang lebih baik. Analisis titrasi ^{1}H-NMR menunjukkan bahwa mekanisme interaksi ion CN^- dengan kemosensor berlangsung melalui model deprotonasi gugus fenolik ($^-$OH) yang meningkatkan proses ICT. Sensitivitas kemosensor ditunjukkan melalui nilai LOD sebesar 4,43 × 10^{-5} M untuk p-NCVA dan 4,99 × 10^{-5} M untuk p-NBVA. Penambahan satu gugus vinil konjugasi pada p-NCVA meningkatkan sensivitas deteksi anion CN^- sebesar 11,22%. Kemosensor mampu mempertahankan respons kolorimetri hingga delapan siklus. Aplikasi pada sampel ubi hutan menggunakan metode larutan dan kertas strip menunjukkan potensi kedua senyawa sebagai kemosensor kolorimetri sederhana untuk pemantauan keamanan pangan.

Kata kunci: ion sianida, donor–π–akseptor (D–π–A), kemosensor, azina, *intramolecular charge transfer* (ICT), basa Schiff.

UNIVERSITAS
GADJAH MADA
Sintesis Kemosensor Azina Asimetris Hibrida vanilinâ€“p-nitrobenzaldehida dan Vanilinâ€“p-nitrosinamaldehida
Maria Lilita Guterres, Prof. Drs. Bambang Purwono, M.Sc., Ph.D.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

SYNTHESIS OF ASYMMETRIC AZINE DERIVATIVE OF VANILIN- WITH p-NITROBENZALDEHYDE AND p-NITROCINNAMALDEHYDE HYBRID

Maria Lilita Guterres
24/540026/PPA/06808

ABSTRACT

Two hybrid azine-based colorimetric chemosensors, p-nitrobenzaldehyde–vanillin azine (p-NBVA) and p-nitrocinnamaldehyde–vanillin azine (p-NCVA), were successfully synthesized. A vinyl group was introduced into p-NCVA to extend the π-conjugation system and enhance the intramolecular charge transfer (ICT) process. The compounds were synthesized via a sonochemical Schiff base condensation method through two reaction pathways: hydrolysis of symmetric azine VA and the hydrazone intermediate pathway involving p-nitrobenzaldehyde and p-cinnamaldehyde. The hydrazone pathway successfully improved the product yield and purity. The synthesized compounds were characterized using FT-IR, ATR-IR, GC-MS, LC-MS, UV-Vis, and ^{1}H- and ^{13}C-NMR spectroscopy. The chemosensing performance was evaluated through solvatochromic, ionochromic, interference, response time, reversibility, and host–guest interaction studies using ^{1}H-NMR analysis, as well as real-sample applications.

Solvatochromic studies revealed a bathochromic shift of up to 170 nm with increasing solvent polarity. Ionochromic and interference studies demonstrated that the chemosensors were selective toward CN^- ions, as indicated by distinct color changes and UV–Vis spectral shifts in DMF solution. Response time studies showed that p-NBVA exhibited a faster response toward CN^- detection, whereas **p-**NCVA provided better signal stability. ^1H-NMR titration analysis indicated that the interaction mechanism between the chemosensors and CN^- ions occurred through deprotonation of the phenolic (–OH) group, thereby enhancing the ICT process. The sensitivity of the chemosensors was demonstrated by LOD values of 4.43×10^{-5} M for p-NCVA and 4.99×10^{-5} M for p-NBVA. The introduction of a single conjugated vinyl group into p-NCVA increased the sensitivity toward CN^- anion detection by 11.22%. The chemosensors maintained their colorimetric response for up to eight reversible cycles. Applications using wild yam samples through solution-based and paper strip methods demonstrated the potential of both compounds as simple colorimetric chemosensors for food safety monitoring.

Keywords: cyanide ion, donor–π–acceptor (D–π–A), chemosensor, azine, intramolecular charge transfer (ICT), schiff base