

DAFTAR PUSTAKA

- Abdalkarim, K.A., Mohammed, S.J., Hasan, A.H., Omer, K.M., Paularokiadoss, F., Hamarouf, R.F., Aziz, K.H.H., Hassan, H.Q., and Jeyakumar, C.T., 2024, An efficient synthesis, structural analysis, and computational studies of benzothiazole derivatives activated by formic acid under solvent-free conditions, *Chemical Physics Impact*, 8, 100402.
- Abraham, J.P., Sajan, D., Shettigar, V., Dharmaprakash, S.M., Němec, I., Hubert Joe, I., and Jayakumar, V.S., 2009, Efficient π -electron conjugated push–pull nonlinear optical chromophore 1-(4-methoxyphenyl)-3-(3,4-dimethoxyphenyl)-2-propen-1-one: A vibrational spectral study, *Journal of Molecular Structure*, 917, 27–36.
- Aksakal, N.E., Aksakal, F., Gül, E.Y., Eçik, E.T., and Yuksel, F., 2024, A fully conjugated imidazole-fused perylene phenantroline ruthenium(II) complex in photocatalytic oxidation, *Inorganica Chimica Acta*, 562, 121882.
- Andrade, J., González-Martínez, C., and Chiralt, A., 2020, Effect of carvacrol in the properties of films based on poly (vinyl alcohol) with different molecular characteristics, *Polymer Degradation and Stability*, 179, 109282.
- Arshad, M.N., Birinji, A.S., Khalid, M., Asiri, A.M., Al-Amry, K.A., Aqlan, F.M.S., and Braga, A.A.C., 2018, Synthesis, spectroscopic, single crystal diffraction and potential nonlinear optical properties of novel pyrazoline derivatives: Interplay of experimental and computational analyses, *Spectrochim Acta Part A: Molecular and Biomolecular Spectroscopy*, 202, 146–158.
- Asiri, A.M., Al-Ghamdi, N.S.M., Dzudzevic-Cancar, H., Kumar, P., and Khan, S.A., 2019, Physicochemical and photophysical investigation of newly synthesized carbazole containing pyrazoline-benzothiazole as fluorescent chemosensor for the detection of Cu^{2+} , Fe^{3+} & Fe^{2+} metal ion, *Journal of Molecular Structure*, 1195, 670–680.
- Bacaloglu, R., and Fisch, M., 1995, Degradation and stabilization of poly (vinyl chloride). V. Reaction mechanism of poly(vinyl chloride) degradation, *Polymer Degradation and Stability*, 47, 33–57.
- Bacani, R., 2019, Gel characterization: From molecules to nanostructure to macroproperties, *Nano Design for Smart Gels*, 141–206.
- Bagus, P.S., Illas, F., Pacchioni, G., and Parmigiani, F., 1999, Mechanisms responsible for chemical shifts of core-level binding energies and their relationship to chemical bonding, *Journal of Electron Spectroscopy and Related Phenomena*, 100, 215–236.
- Bahn Müller, S., Loi, C.H., Linge, K.L., Gunten, U. von, and Canonica, S., 2015, Degradation rates of benzotriazoles and benzothiazoles under UV-C

- irradiation and the advanced oxidation process UV/H₂O₂, *Water Research*, 74, 143–154.
- Bano, S., Javed, K., Ahmad, S., Rathish, I.G., Singh, S., and Alam, M.S., 2011, Synthesis and biological evaluation of some new 2-pyrazolines bearing benzene sulfonamide moiety as potential anti-inflammatory and anti-cancer agents, *European Journal of Medical Chemistry reports*, 46, 5763–5768.
- Bansod, B.K., Kumar, T., Thakur, R., Rana, S., and Singh, I., 2017, A review on various electrochemical techniques for heavy metal ions detection with different sensing platforms, *Biosensors and Bioelectronics*, 94, 443–455.
- Batley, G.E., Apte, S.C., and Stauber, J.L., 2004, Speciation and bioavailability of trace metals in water: Progress since 1982, *Australian Journal of Chemistry*, 57, 903–919.
- Benzon, K.B., Mary, Y.S., Varghese, H.T., Panicker, C.Y., Armaković, S., Armaković, S.J., Pradhan, K., Nanda, A.K., and Van Alsenoy, C., 2017, Spectroscopic, DFT, molecular dynamics and molecular docking study of 1-butyl-2-(4-hydroxyphenyl)-4,5-dimethyl-imidazole 3-oxide, *Journal of Molecular Structure*, 1134, 330–344.
- Bo, M., Wang, Y., Huang, Y., Zhou, W., Li, C., and Sun, C.Q., 2014, Coordination-resolved local bond relaxation and electron binding-energy shift of Pb solid skins and atomic clusters, *Journal of Materials Chemistry C*, 2, 6090–6096.
- Boeck, P., Bandeira Falcão, C.A., Leal, P.C., Yunes, R.A., Filho, V.C., Torres-Santos, E.C., and Rossi-Bergmann, B., 2006, Synthesis of chalcone analogues with increased antileishmanial activity, *Bioorganic & Medical Chemistry*, 14, 1538–1545.
- Bozkurt, E., and Gul, H.I., 2018, A novel pyrazoline-based fluorometric “turn-off” sensing for Hg²⁺, *Sensors and Actuators B: Chemical*, 255, 814–825.
- Bozkurt, E., and Gul, H.I., 2020, Selective fluorometric “Turn-off” sensing for Hg²⁺ with pyrazoline compound and its application in real water sample analysis, *Inorganica Chimica Acta*, 502, 119288.
- Bryant, S.J., Christofferson, A.J., Greaves, T.L., McConville, C.F., Bryant, G., and Elbourne, A., 2022, Bulk and interfacial nanostructure and properties in deep eutectic solvents: Current perspectives and future directions, *Journal of Colloid and Interface Science*, 608, 2430–2454.
- Câmara, V.S., Debia, N.P., Silva Junior, H.C., Ceschi, M.A., and Rodembusch, F.S., 2024, Multiple fluorescence within a single ESIPT system: Orchestrating the emission of Lophine-Benzothiazole dyads via excitation wavelength and solvent, *Journal of Molecular Liquids*, 398, 124231.
- Cao, X.Q., Lin, X.H., Zhu, Y., Ge, Y.Q., and Wang, J.W., 2012, The optical properties, synthesis and characterization of novel 5-aryl-3-benzimidazolyl-1-phenyl-pyrazoline derivatives, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 98, 76–80.

- Champagne, B., Deleuze, M.S., de Proft, F., and Leyssens, T., 2013, Introduction to computational chemistry, 2nd ed. John Wiley & Sons, Ltd, Denmark.
- Chemchem, M., Yahaya, I., Aydin, B., Doluca, O., Seferoğlu, N., and Seferoğlu, Z., 2020, Substituent dependent selectivity of fluorescent chemosensors derived from coumarin for biologically relevant DNA structures and anions, *Sensors and Actuators B: Chemical*, 305, 127316.
- Chen, C.H., Chung, W.H., and Ding, W.H., 2020, Determination of benzotriazole and benzothiazole derivatives in marketed fish by double-vortex-ultrasonic assisted matrix solid-phase dispersion and ultrahigh-performance liquid chromatography-high resolution mass spectrometry, *Food Chemistry*, 333, 127516.
- Chibac, A.L., Roman, G., Cojocaru, C., Shova, S., Sacarescu, G., Simionescu, M., and Sacarescu, L., 2019, Bichromophoric pyrazoline derivative with solvent-selective photoluminescence quenching, *Journal of Molecular Liquids*, 278, 156–163.
- Choi, Y.W., Park, G.J., Na, Y.J., Jo, H.Y., Lee, S.A., You, G.R., and Kim, C., 2014, A single Schiff base molecule for recognizing multiple metal ions: A fluorescence sensor for Zn(II) and Al(III) and colorimetric sensor for Fe(II) and Fe(III), *Sensors and Actuators B: Chemical*, 194, 343–352.
- Ciupa, A., Mahon, M.F., Bank, D.P.A., and Caggiano, L., 2012, Simple pyrazoline and pyrazole “turn on” fluorescent sensors selective for Cd²⁺ and Zn²⁺ in MeCN, *Organic and Biomolecular Chemistry*, 10, 8753–8757.
- Cocca, L.H.Z., Valverde, J.V.P., Bescont, L.J., Patient, B.C., Piguel, S., Silva, D.L., Mendonca, C.R., and Boni, D.L., 2024, Photophysical properties of 3-arylthioimidazo[1,2-a]pyridine derivatives: The role of peripheral electron-donating and electron-withdrawing groups in the advance of organic materials engineering, *Journal of Molecular Structure*, 1300, 137221.
- Cortizo, M.S., Larsen, D.O., Bianchetto, H., and Alessandrini, J.L., 2004, Effect of the thermal degradation of SBS copolymers during the ageing of modified asphalts, *Polymer Degradation and Stability*, 86, 275–282.
- Czarnik, A.W., 1994, Chemical communication in water using fluorescent chemosensors, *Accounts and Chemical Research*, 27, 302–308.
- Czarnik, A.W., 1993, Fluorescent chemosensors for ion and molecule recognition, *American Chemical Society*, Washington, DC.
- Daly, B., Ling, J., and Silva, D.A.P., 2015, Current developments in fluorescent PET (photoinduced electron transfer) sensors and switches, *Chemical Society Reviews*, 44, 4203–4211.
- Das, A., Das, U., and Das, A.K., 2023, Relativistic effects on the chemical bonding properties of the heavier elements and their compounds, *Coordination Chemistry Reviews*, 479, 215000.

- Dash, B., and Karim, S., 2021, Pyrazoline heterocyclic : A review, *International Journal of Pharmaceutical Sciences and Research*, 12, 2570.
- Davidovich, R.L., Stavila, V., Marinin, D. V., Voit, E.I., and Whitmire, K.H., 2009, Stereochemistry of lead(II) complexes with oxygen donor ligands, *Coordination Chemistry Reviews*, 253, 1316–1352.
- Demas, J., and Crosby, G., 1971, Measurement of photoluminescence quantum yields. Review, *The Journal of Physical Chemistry*, 75, 991–1024.
- Devi, K.S., Subramani, P., Sundaraganesan, N., Boobalan, M.S., and Tamilvendan, D., 2020, Investigation on spectra (UV–Vis, vibrational, NMR, HRMS), electronic structure (DFT calculations), molecular docking and antidiabetic activity of N-((benzo[d]thiazol-2-ylthio)methyl)-N-cyclohexylcyclohexanamine – A Mannich base, *Journal of Molecular Structure*, 1219, 128604.
- Diana, R., Caruso, U., Di Costanzo, L., Gentile, F.S., and Panunzi, B., 2021, Colorimetric recognition of multiple first-row transition metals: A single water-soluble chemosensor in acidic and basic conditions, *Dyes and Pigments*, 184, 108832.
- Domingo, L.R., Perez, P., Contreras, R., 2004, Reactivity of the carbon–carbon double bond towards nucleophilic additions. A DFT analysis, *Tetrahedron*, 60, 6585–6591.
- Dong, X., Han, J.H., Heo, C.H., Kim, H.M., Liu, Z., and Cho, B.R., 2012, Dual-color imaging of magnesium/calcium ion activities with two-photon fluorescent probes, *Analytical Chemistry*, 84, 8110–8113.
- Dvornick, P.R., and Lenz'j, R.W., 1992, Exactly alternating silarylene-siloxane polymers: Relationships between polymer structure and glass transition temperature, *Macromolecules*, 25, 3769–3778.
- Eiler, J., Cesar, J., Chimiak, L., Dallas, B., Grice, K., Griep-Raming, J., Juchelka, D., Kitchen, N., Lloyd, M., Makarov, A., Robins, R., and Schwieters, J., 2017, Analysis of molecular isotopic structures at high precision and accuracy by Orbitrap mass spectrometry, *International Journal of Mass Spectrometry*, 422, 126–142.
- Ekar, J., and Kranjc., 2020, Synthesis of nydrazinylpyridines via nucleophilic aromatic substitution and further transformation to bicyclo[2.2.2]octenes fused with two N-aminosuccinimide moieties, *Synthesis*, 53, 1112–1120.
- Elattar, R.H., El-Malla, S.F., Kamal, A.H., and Mansour, F.R., 2024, Applications of metal complexes in analytical chemistry: A review article, *Coordination Chemistry Reviews*, 501, 215568.
- Elguero, J., Molina, P., and Lévai, A., 2005, Synthesis of chlorinated 3,5-diaryl-2-pyrazolines by the reaction of chlorochalcones with hydrazines, *Arkivoc*, 09, 344–352.

- El-Nahass, M.N., El-Aziz, D.M.A., and Fayed, T.A., 2014, Selective “on–off–on” switchable chemosensor for metal ions detection and its complexes, *Sensors and Actuators B: Chemical*, 205, 377–390.
- Ernst, L., 2006, Recent advances in NMR studies of cyclophanes, *Annual Reports on NMR Spectroscopy*, 60, 77–143.
- Faglioni, F., Ligabue, A., Pelloni, S., Soncini, A., Viglione, R.G., Ferraro, M.B., Zanasi, R., and Lazzeretti, P., 2005, Why downfield proton chemical shifts are not reliable aromaticity indicators, *Organic Letters*, 7, 3457–3460.
- Fan, L.J., Zhang, Y., Murphy, C.B., Angell, S.E., Parker, M.F.L., Flynn, B.R., and Jones, W.E., 2009, Fluorescent conjugated polymer molecular wire chemosensors for transition metal ion recognition and signaling, *Coordination Chemistry Reviews*, 253, 410–422.
- Farruggia, G., Iotti, S., Prodi, L., Montaiti, M., Zaccheroni, N., Savage, P.B., Trapani, V., Sale, P., and Wolf, F.I., 2007, 8-Hydroxyquinoline derivatives as fluorescent sensors for magnesium in living cells, *Journal of the American Chemical Society*, 129, 1470.
- Fernandes, R.S., Tiwari, A., Kanungo, S., and Dey, N., 2023, Formation of stable naphthalenediimide radical anion: Substituent-directed synergistic effects of hydrogen bonding and charge transfer interactions on chromogenic response towards hydrazine, *Journal of Molecular Liquids*, 387, 122238.
- Filipiak, M.S., Rother, M., Andoy, N.M., Knudsen, A.C., Grimm, S., Bachran, C., Swee, L.K., Zaumseil, J., and Tarasov, A., 2018, Highly sensitive, selective and label-free protein detection in physiological solutions using carbon nanotube transistors with nanobody receptors, *Sensors and Actuators B: Chemical*, 255, 1507–1516.
- Firdaus, F., Farhi, A., Faraz, M., and Shakir, M., 2018, Benzidine based fluorescent probe for the sensitive detection of heavy metal ions via chelation enhanced fluorescence mechanism—A multiplexed sensing platform, *Journal of Luminescence*, 199, 475–482.
- Florez, E., Zapata-Escobar, A.D., Ferraro, F., Ibargüen Becerra, C., Chamorro, Y., and Maldonado, A.F., 2023, Coordination of mercury(II) in water promoted over hydrolysis in solvated clusters $[\text{Hg}(\text{H}_2\text{O})_1-6](\text{aq})^{2+}$: Insights from relativistic effects and free energy analysis, *The Journal of Physical Chemistry A*, 127, 8032–8049.
- Fu, H.Y., Gao, X.D., Zhong, G.Y., Zhong, Z.Y., Xiao, F., and Shao, B.X., 2009, Synthesis and electroluminescence properties of benzothiazole derivatives, *Journal of Luminescence*, 129, 1207–1214.
- Fukuzumi, S., and Ohkubo, K., 2010, Metal ion-coupled and decoupled electron transfer, *Coordination Chemistry Reviews*, 254, 372–385.

- Gaonkar, S.L. and Vignesh, U.N., 2017, Synthesis and pharmacological properties of chalcones: a review, *Research on Chemical Intermediates*, 43, 6043–6077.
- Ge, H., Ye, Q., Zou, T., Zhang, D., Liu, H., and Yang, R., 2024, Recent progress of molecular fluorescent probes with multi-recognition sites enable sensitive and selective analysis, *Trends in Analytical Chemistry*, 174, 117685.
- Genty, B., Briantais, J.M., and Baker, N.R., 1989, The relationship between the quantum yield of photosynthetic electron transport and quenching of chlorophyll fluorescence, *Biochimica et Biophysica Acta (BBA)-General Subjects*, 990, 87–92.
- Giri, D., Bankura, A., and Patra, S.K., 2018, Poly(benzodithieno-imidazole-alt-carbazole) based π -conjugated copolymers: Highly selective and sensitive turn-off fluorescent probes for Hg^{2+} , *Polymer*, 158, 338–353.
- Gol, R.M., Khokhani, K.M., Khatri, T.T., and Bhatt, J.J., 2014, Synthesis of novel pyrazolines of medicinal interest, *Journal of the Korean Chemical Society*, 58, 49–56.
- Golobanov, A.A., Odin, I.S., Gusev, D.M., Vologzhanina, A.V., Sosnin, I.M., Grabov, S.A., 2021, Reactivity of cross-conjugated enynones in cyclocondensations with hydrazines: Synthesis of pyrazoles and pyrazolines, *The Journal of Organic Chemistry*, 86, 7229–7241.
- Gomes, J.A.N.F., and Mallion, R.B., 2001, Aromaticity and ring currents, *Chemical Reviews*, 101, 1349–1383.
- Gooijer, C., Kok, S.J., and Ariele, F., 2000, Capillary electrophoresis with laser-induced fluorescence detection for natively fluorescent analytes, *Luminescence Spectroscopy*, 28, 679–685.
- Guerchais, V., and Fillaut, J.L., 2011, Sensory luminescent iridium(III) and platinum(II) complexes for cation recognition, *Coordination Chemical Reviews*, 255, 2448–2457.
- Gunnlaugsson, T., Akkaya, E.U., Yoon, J., James, T.D., Wu, D., and Sedgwick, A.C., 2017, Fluorescent chemosensors: the past, present and future, *Chemical Society Reviews*, 46, 7105.
- Hamisu, A.M., Ariffin, A., and Wibowo, A.C., 2020, Cation exchange in metal-organic frameworks (MOFs): The hard-soft acid-base (HSAB) principle appraisal, *Inorganica Chimica Acta*, 511, 119801.
- Han, Z., Yan, J., Tang, H.Q., He, Y., Zhu, U., and Ge, Y.Q., 2017, Novel simple fluorescent sensor for nickel ions, *Tetrahedron Letters*, 58, 1254–1257.
- Hawkes, S.J., 1997, What is a "heavy metal"?, *Journal of Chemical Education*, 74, 1374

- He, H., Mortellaro, M.A., Leiner, M.J.P., Fraatz, R.J., and Tusa, J.K., 2003, A fluorescent sensor with high selectivity and sensitivity for potassium in water, *Journal of the American Chemical Society*, 125, 1468–1469.
- Heine, T., Corminboeuf, C., and Seifert, G., 2005, The magnetic shielding function of molecules and pi-electron delocalization, *Chemical Reviews*, 105, 3889–3910.
- Hernández, O.J., and Portilla, J., 2017, Synthesis of dicyanovinyl-substituted 1-(2-pyridyl)pyrazoles: Design of a fluorescent chemosensor for selective recognition of cyanide, *The Journal of Organic Chemistry*, 82, 13376–13385.
- Holland, P.L., 2008, Electronic structure and reactivity of three-coordinate iron complexes, *Accounts of Chemical Research*, 41, 905–914.
- Hu, J., and Zhang, C.Y., 2013, Simple and accurate quantification of quantum yield at the single-molecule/particle level, *Analytical Chemistry*, 85, 2000–2004.
- Hu, J.J., Wong, N.K., Ye, S., Chen, X., Lu, M.Y., Zhao, A.Q., Guo, Y., Ma, A.C.H., Leung, A.Y.H., Shen, J., and Yang, D., 2015, Fluorescent probe HKSOX-1 for imaging and detection of endogenous superoxide in live cells and in vivo, *Journal of the American Chemical Society*, 137, 6837–6843.
- Hu, S., Song, J., Wu, G., Cheng, C., and Gao, Q., 2015, A new pyrazoline-based fluorescent sensor for Al^{3+} in aqueous solution, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 136, 1188–1194.
- Hu, S., Zhang, S., Gao, C., Xu, C., and Gao, Q., 2013, A new selective fluorescent sensor for Fe^{3+} based on a pyrazoline derivative, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 113, 325–331.
- Hu, Zhang, S., Hu, Y., Tao, Q., and Wu, A., 2013, A new selective pyrazoline-based fluorescent chemosensor for Cu^{2+} in aqueous solution, *Dyes and Pigments*, 96, 509–515.
- Husain, K., Abid, M., and Azam, A., 2008, Novel Pd(II) complexes of 1-N-substituted 3-phenyl-2-pyrazoline derivatives and evaluation of antiamoebic activity, *European Journal of Medicinal Chemistry Reports*, 43, 393–403.
- Iguarbe, V., Romero, P., Barberá, J., Elduque, A., and Giménez, R., 2022, Dual liquid crystalline/Gel behavior with AIE effect promoted by self-assembly of pyrazole dendrons, *Journal of Molecular Liquids*, 365, 120109.
- Isaad, J., and Achari, A. El., 2023, Colorimetric probe for sequential chemosensing of mercury(II) and cyanide ions in aqueous media, based on a benzoxadiazole-pyrazolin-5-one glycoconjugate with INHIBIT logic gate response, *Journal of Molecular Structure*, 1271, 134036.
- Islam, S., Mansha, A., and Asim, S., 2023, Effects of metal ions and substituents on HOMO–LUMO gap evident from UV–Visible and fluorescence spectra of anthracene derivatives, *Journal of Fluorescence*, 2–29.

- Jagtap, A.R., Satam, V.S., Rajule, R.N., and Kanetkar, V.R., 2011, Synthesis of highly fluorescent coumarinyl chalcones derived from 8-acetyl-1,4-diethyl-1,2,3,4-tetrahydro-7H-pyrano[2,3-g]quinoxalin-7-one and their spectral characteristics, *Dyes and Pigments*, 91, 20–25.
- Jeyanthi, D., Iniya, M., Krishnaveni, K., and Chellappa, D., 2016, Charge transfer based “turn-on” chemosensor for Zn^{2+} ion recognition using new triaryl pyrazoline derivative, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 159, 231–237.
- Jiao, Y., Zuo, Y., Yang, H., Gao, X., and Duan, C., 2021, Photoresponse within dye-incorporated metal-organic architectures, *Coordination Chemistry Reviews*, 430, 213648.
- Karaca, H., and Kazancı, S., 2022, The metal sensing applications of chalcones: The synthesis, characterization and theoretical calculations, *Journal of Molecular Structure*, 1248, 131454.
- Kaur, N., Kaur, G., Fegade, U.A., Singh, A., Sahoo, S.K., Kuwar, A.S., and Singh, N., 2017, Anion sensing with chemosensors having multiple NH recognition units, *TrAC Trends in Analytical Chemistry*, 95, 86–109.
- Keri, R.S., Patil, M.R., Patil, S.A., and Budagupi, S., 2015^a, A comprehensive review in current developments of benzothiazole-based molecules in medicinal chemistry, *European Journal of Medicinal Chemistry Reports*, 89, 207–251.
- Keri, R.S., Patil, M.R., Patil, S.A., and Budagupi, S., 2015^b, A comprehensive review in current developments of benzothiazole-based molecules in medicinal chemistry, *European Journal of Medicinal Chemistry Reports*, 89, 207–251.
- Khan, S., Chen, X., Almahri, A., Allehyani, E.S., Alhumaydhi, F.A., Ibrahim, M.M., and Ali, S., 2021, Recent developments in fluorescent and colorimetric chemosensors based on Schiff bases for metallic cations detection: A review, *Journal of Environmental Chemical Engineering*, 9, 106381.
- Kitevski, L., Julianne, L., and Prosser, R.S., 2012, Current applications of ^{19}F NMR to studies of protein structure and dynamics, *Progress in Nuclear Magnetic Resonance Spectroscopy*, 62, 1–33.
- Kolbasov, A., Sinha-Ray, S., Yarin, A.L., and Pourdeyhimi, B., 2017, Heavy metal adsorption on solution-blown biopolymer nanofiber membranes, *Journal of Membrane Science*, 530, 250–263.
- Kubin, R.F. and Fletcher, A.N., 1982, Fluorescence quantum yields of some rhodamine dyes, *Journal of Luminescence*, 27, 455–462.
- Kumar, A., Kumar, R., Gupta, A., Tandon, P., and D’silva, E.D., 2017, Molecular structure, nonlinear optical studies and spectroscopic analysis of chalcone derivative (2E)-3-[4-(methylsulfanyl) phenyl]-1-(3-bromophenyl) prop-2-

en-1-one by DFT calculations, *Journal of Molecular Structure*, 1150, 166–178.

- Kumar, H., Devaraji, V., Joshi, R., Jadhao, M., Ahirkar, P., Prasath, R., Bhavana, P., and Ghosh, S.K., 2015, Antihypertensive activity of a quinoline appended chalcone derivative and its site specific binding interaction with a relevant target carrier protein, *RSC Advances*, 5, 65496–65513.
- Kumar, K.C., Trivedi, R., Giribabu, L., Niveditha, S., Bhanuprakash, K., and Sridhar, B., 2015, Ferrocenyl pyrazoline based multichannel receptors for a simple and highly selective recognition of Hg^{2+} and Cu^{2+} ions, *Journal of Organometallic Chemistry*, 780, 20–29.
- Kumar, V.V., Ramadevi, D., Ankathi, V.M., Pradhan, T.K., and Basavaiah, K., 2020, Development of porphyrin-based chemosensor for highly selective sensing of fluoride ion in aqueous media, *Microchemical Journal*, 157, 105028.
- Kumar, R., Kaur, N., Kaur, R., Kaur, N., Sahoo, S.C., and Nanda, P.K., 2022, Temperature controlled synthesis and transformation of dinuclear to hexanuclear zinc complexes of a benzothiazole based ligand: Coordination induced fluorescence enhancement and quenching, *Journal of Molecular Structure*, 1265, 133300.
- Kundu, B.K., Mandal, P., Mukhopadhyay, B.G., Tiwari, R., Nayak, D., Ganguly, R., and Mukhopadhyay, S., 2019, Substituent dependent sensing behavior of Schiff base chemosensors in detecting Zn^{2+} and Al^{3+} ions: Drug sample analysis and living cell imaging, *Sensors and Actuators B: Chemical*, 282, 347–358.
- Kuppuraj, G., Dudev, M., and Lim, C., 2009, Factors governing metal-ligand distances and coordination geometries of metal complexes, *The journal of physical chemistry B*, 113, 2952–2960.
- Lee, D.H., Im, J.H., Son, S.U., Chung, Y.K., and Hong, J.I., 2003, An azophenol-based chromogenic pyrophosphate sensor in water, *Journal of the American Chemical Society*, 125, 7752–7753.
- Lee, E., Ogata, Y., Seto, R., Himori, S., and Gotoh, H., 2024, Naphthoic acid derivatives as photosensitizers for short-wavelength α -hydroxyacetophenone photoinitiators, *Journal of Photopolymer Science and Technology*, 37, 135–140.
- Lees, A.J., 1995, The Luminescence rigidochromic effect exhibited by organometallic complexes: Rationale and applications, *Comments on Inorganic Chemistry*, 17, 319–346.
- Li, J.F., Guan, B., Li, D.X., and Dong, C., 2007, Study on the fluorescence properties of a new intramolecular charge transfer compound 1,5-diphenyl-3-(N-ethylcarbazole-3-yl)-2-pyrazoline, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 68, 404–408.

- Li, W., Zhang, Z., Zhou, W., and Liu, J., 2017, Kinetic discrimination of metal ions using DNA for highly sensitive and selective Cr^{3+} detection, *ACS Sensors*, 2, 663–669.
- Li, X., Lu, X., Xing, M., Yang, X.H., Zhao, T.T., Gong, H. Bin, and Zhu, H.L., 2012, Synthesis, biological evaluation, and molecular docking studies of N,1,3-triphenyl-1H-pyrazole-4-carboxamide derivatives as anticancer agents, *Bioorganic & Medicinal Chemistry Letters*, 22, 3589–3593.
- Liu, S., Wang, Y.M., and Han, J., 2017, Fluorescent chemosensors for copper(II) ion: Structure, mechanism and application, *Journal of Photochemistry and Photobiology C*, 32, 78–103.
- Liu, Y., Ogawa, K., and Schanze, K.S., 2009, Conjugated polyelectrolytes as fluorescent sensors, *Journal of Photochemistry and Photobiology C*, 10, 173–190.
- Lu, Y., Liang, X., Niyungeko, C., Zhou, J., Xu, J., and Tian, G., 2018, A review of the identification and detection of heavy metal ions in the environment by voltammetry, *Talanta*, 178, 324–338.
- Madhu, P., and Sivakumar, P., 2019, A novel pyridine-pyrazole based selective “turn-off” fluorescent chemosensor for Fe(III) ions, *Journal of Photochemistry and Photobiology A: Chemistry*, 371, 341–348.
- Malatesta, 2002, Photodegradation of organic photochromes, *Organic Photochromic and Thermochromic Compounds*, 2, 65–165.
- Paczkowski, I.M., Pluczinski, L.D.S., and Campo, L.F., 2024, Synthesis, solvatochromism and estimation of ground and excited state dipole moments of silylated benzothiazole dyes, *Journal of Fluorescence*, 34, 809–819.
- Mandal, A.K., Suresh, M., Suresh, E., Mishra, S.K., Mishra, S., and Das, A., 2010, A chemosensor for heavy-transition metal ions in mixed aqueous–organic media, *Sensors and Actuators B: Chemical*, 145, 32–38.
- Manirethan, V., Raval, K., Rajan, R., Thaira, H., and Balakrishnan, R.M., 2018, Kinetic and thermodynamic studies on the adsorption of heavy metals from aqueous solution by melanin nanopigment obtained from marine source: *Pseudomonas stutzeri*, *Journal of environmental management*, 214, 315–324.
- Martín, J., Mejías, C., Santos, J.L., Aparicio, I., Alonso, E., and Heinze, J., 2024, Quantification of linear alkylbenzene sulphonates in complex sludge samples: Influence of matrix effects in calibration methods, *Microchemical Journal*, 204, 111089.
- Martínez, R., Zapata, F., Caballero, A., Espinosa, A., Tárraga, A., and Molina, P., 2006, 2-Aza-1,3-butadiene derivatives featuring an anthracene or pyrene unit: Highly selective colorimetric and fluorescent signaling of Cu^{2+} cation, *Organic letters*, 8, 3235–3238.

- Masui, H., 2001, Metalloaromaticity, *Coordination Chemistry Reviews*, 219–221, 957–992.
- Mathew, B., Suresh, J., Mathew, G.E., Haridas, A., Suresh, G., and Sabreena, P., 2016, Synthesis, ADME studies, toxicity estimation, and exploration of molecular recognition of thiophene based chalcones towards monoamine oxidase-A and B, *Beni-Suef University Journal of Basic and Applied Sciences*, 5, 396–401.
- McBeath, A.V., and Smernik, R.J., 2009, Variation in the degree of aromatic condensation of chars, *Organic Geochemistry*, 40, 1161–1168.
- Mishra, J., Kaur, H., Ganguli, A.K., and Kaur, N., 2018, Fluorescent chemosensor based on urea/thiourea moiety for sensing of Hg(II) ions in an aqueous medium with high sensitivity and selectivity: A comparative account on effect of molecular architecture on chemosensing, *Journal of Molecular Structure*, 1161, 34–43.
- Morishima, I., Kurono, M., and Shiro, Y., 1986, Presence of endogenous calcium ion in horseradish peroxidase. Elucidation of metal-binding site by substitutions of divalent and lanthanide ions for calcium and use of metal-induced NMR (^1H and ^{13}C) resonances., *Journal of Biological Chemistry*, 261, 9391–9399.
- Morkin, T.L., and Leigh, W.J., 2000, Substituent Effects on the Reactivity of the Silicon–Carbon Double Bond, *Accounts of Chemical Research*, 34, 129–136.
- Mukherjee, A.G., Renu, K., Gopalakrishnan, A.V., Veeraraghavan, V.P., Vinayagam, S., Paz-Montelongo, S., Dey, A., Vellingiri, B., George, A., Madhyastha, H., and Ganesan, R., 2023, Heavy metal and metalloid contamination in food and emerging technologies for its detection, *Sustainability*, 15, 1195.
- Mulliken, R.S., 1959, Bond lengths and bond energies in conjugation and hyperconjugation, *Tetrahedron*, 6, 68–87.
- Nadin, A., Eicher, T., Hauptmann, S., and Speicher, A., 2004, The chemistry of heterocycles: Structures, reactions, synthesis, and applications. 2nd Edition, Wiley-VCH. Weinheim.
- Namieśnik, J., and Rabajczyk, A., 2010, The speciation and physico-chemical forms of metals in surface waters and sediments, *Chemical Speciation & Bioavailability*, 22, 1–24.
- Nebhani, L. and Jaisingh, A., 2020, Chemical analysis of polymers., *Polymer Science and Innovative Applications*. Elsevier, Chapter 3, 69–116.
- Nilsson, K.B., Maliarik, M., Persson, I., Fischer, A., Ullström, A.S., Eriksson, L., and Sandström, M., 2008, Coordination chemistry of mercury(II) in liquid and aqueous ammonia solution and the crystal structure of tetraamminemercury(II) perchlorate, *Inorganic chemistry*, 47, 1953–1964.

- Padalkar, V.S., Phatangare, K.R., and Sekar, N., 2013, Synthesis of novel fluorescent 2-{4-[1-(pyridine-2-yl)-1H-pyrazol-3-yl] phenyl}-2H-naphtho [1,2-d] [1,2,3] triazolyl derivatives and evaluation of their thermal and photophysical properties, *Journal of Heterocyclic Chemistry*, 50, 809–813.
- Pang, C., Jung, J.Y., Lee, J.W., and Kang, Y.T., 2012, Thermal conductivity measurement of methanol-based nanofluids with Al₂O₃ and SiO₂ nanoparticles, *International Journal of Heat and Mass Transfer*, 55, 5597–5602.
- Patil, A., Ware, A.P., Bhand, S., Chakrovarty, D., Gonnade, R., Pingale, S.S., and Salunke-Gawali, S., 2016, Naphthoquinone based chemosensor 2-(2'-aminoethylpyridine)-3-chloro-1,4-naphthoquinone: Detection of metal ions, X-ray -crystal structures and DFT studies, *Journal of Molecular Structure*, 1114, 132–143.
- Patil, D.M., Phalak, G.A., and Mhaske, S.T., 2017, Design and synthesis of bio-based UV curable PU acrylate resin from itaconic acid for coating applications, *Designed monomers and polymers*, 20, 269–282.
- Patil, V.M., Gupta, S.P., Masand, N., and Balasubramanian, K., 2024, Experimental and computational models to understand protein-ligand, metal-ligand and metal-DNA interactions pertinent to targeted cancer and other therapies, *European Journal of Medicinal Chemistry Reports*, 10, 100133.
- Pavithra, K.G., Kumar, P.S., Jaikumar, V., and Rajan, P.S., 2019, Removal of colorants from wastewater: A review on sources and treatment strategies, *Journal of Industrial and Engineering Chemistry*, 75, 1–19.
- Peng, W., Li, H., Liu, Y., and Song, S., 2017, A review on heavy metal ions adsorption from water by graphene oxide and its composites, *Journal of Molecular Liquids*, 230, 496–504.
- Perdana, F., Wijaya, K., and Armunanto, R., 2018, Studi teoritis senyawa turunan kalkon hidroksi sebagai sensor kimia berbagai anion, *Jurnal Kimia Riset*, 3, 95–101.
- Perrin, C.L., and Chang, K.L., 2016, The complete mechanism of an aldol condensation, *The Journal of organic Chemistry*, 81, 5631–5635.
- Poojary, S., Acharya, M., Abdul Salam, A.A., Kekuda, D., Nayek, U., Madan Kumar, S., Adhikari, A.V., and Sunil, D., 2019, Highly fluorescent materials derived from ortho-vanillin: Structural, photophysical electrochemical and theoretical studies, *Journal of Molecular Liquids*, 275, 792–806.
- Poranne, G.R., and Stanger, A., 2021, Aromaticity: Modern Computational Methods and Applications. Elsevier, Chapter 4, 99–153.
- Powers, D.G., Casebier, D.S., Fokas, D., Ryan, W.J., Troth, J.R., and Coffen, D.L., 1998, Automated parallel synthesis of chalcone-based screening libraries, *Tetrahedron*, 54, 4085–4096.

- Pranowo, H.D., and Hetadi, A.K.R., 2011, Pengantar Kimia Komputasi, Cetakan I, Lubuk Agung, Bandung.
- Silva, A.P.D., Gunaratne, H.Q.N., Gunnlaugsson, T., Huxley, A.J.M., McCoy, C.P., Rademacher, J.T., and Rice, T.E., 1997, Signaling recognition events with fluorescent sensors and switches, *Chemical Reviews*, 97, 1511–1566.
- Priyanga, K.T.A., Kurniawan, Y.S., Yuliati, L., Purwono, B., Wahyuningsih, T.D., and Lintang, H.O., 2021, Novel luminescent Schiff's base derivative with an azo moiety for ultraselective and sensitive chemosensor of Fe³⁺ ions, *Luminescence*, 36, 1239–1248.
- Rafiq, M., Salim, M., Noreen, S., Ahmad Khera, R., Noor, S., Yaqoob, U., and Iqbal, J., 2022, End-capped modification of dithienosilole based small donor molecules for high performance organic solar cells using DFT approach, *Journal of Molecular Liquids*, 345, 118138.
- Rahman, M.A., and Siddiqui, A.A., 2010, Pyrazoline derivatives: A worthy insight into the recent advances and potential pharmacological activities, *International Journal of Pharmaceutical Sciences and Drug Research*, 2, 165–175.
- Rammohan, A., Reddy, J.S., Sravya, G., Rao, C.N., and Zyryanov, G.V., 2020, Chalcone synthesis, properties and medicinal applications: a review, *Environmental Chemistry Letters*, 18, 433–458.
- Rani, M., Yusuf, M., and Khan, S.A., 2012, Synthesis and *in-vitro*-antibacterial activity of [5-(furan-2-yl)-phenyl]-4,5-carbothioamide-pyrazolines, *Journal of Saudi Chemical Society*, 16, 431–436.
- Raczyn and Kosin., 2005, Tautomeric Equilibria in Relation to Pi-Electron Delocalization, *Chemical Reviews*, 105, 3561–3612.
- Riddle, F.L., and Fowkes, F.M., 1990, Spectral shifts in acid-base chemistry, *Journal of the American Chemical Society*, 112, 4–52.
- Rochat, M.J., Caruana, F., Jezzini, A., Escola, L., Intskirveli, I., Grammont, F., Gallese, V., Rizzolatti, G., and Umiltà, M.A., 2010, Responses of mirror neurons in area F5 to hand and tool grasping observation, *Experimental Brain Research*, 204, 605–616.
- Rodrigues, M., Baptista, B., Lopes, J.A., and Sarraguça, M.C., 2018, Pharmaceutical cocrystallization techniques. Advances and challenges, *International Journal of Pharmaceutics*, 547, 404–420.
- Roman, G., 2024, Chemistry and uses of 1-(2-benzothiazolyl)pyrazolines: A mini-review, *Journal of Fluorescence*, 155, 401–417.
- Rulíšek, L., and Vondrášek, J., 1998, Coordination geometries of selected transition metal ions (Co²⁺, Ni²⁺, Cu²⁺, Zn²⁺, Cd²⁺, and Hg²⁺) in metalloproteins, *Journal of inorganic biochemistry*, 71, 115–127.

- Săcărescu, L., Chibac-Scutaru, A.L., Roman, G., Săcărescu, G., and Simionescu, M., 2023, Selective detection of metal ions, sulfites and glutathione with fluorescent pyrazolines: a review, *Environmental Chemistry Letters*, 21, 561–596.
- Sahmoune, M.N., 2018, Performance of *Streptomyces rimosus* biomass in biosorption of heavy metals from aqueous solutions, *Microchemical Journal*, 141, 87–95.
- Salgado, A., and Chankvetadze, B., 2016, Applications of nuclear magnetic resonance spectroscopy for the understanding of enantiomer separation mechanisms in capillary electrophoresis, *Journal of Chromatography A*, 1467, 95–144.
- Sandoval, O.G.M., Trujillo, G.C.D., and Orozco, A.E.L., 2018, Amorphous silica waste from a geothermal central as an adsorption agent of heavy metal ions for the regeneration of industrial pre-treated wastewater, *Water Resources and Industry*, 20, 15–22.
- Shakya, S., and Khan, I.M., 2021, Charge transfer complexes: Emerging and promising colorimetric real-time chemosensors for hazardous materials, *Journal of Hazardous Materials*, 403, 123537.
- Sharma, H., Kaur, N., Singh, A., Kuwar, A., and Singh, N., 2016, Optical chemosensors for water sample analysis, *Journal of Materials Chemistry C*, 4, 5154–5194.
- Sheetal, Sengupta, S., Singh, M., Thakur, S., Pani, B., Banerjee, P., Kaya, S., and Singh, A.K., 2022, An insight about the interaction of Aryl Benzothiazoles with mild steel surface in aqueous HCl solution, *Journal of Molecular Liquids*, 354, 118890.
- Shyamal, M., Mazumdar, P., Maity, S., Samanta, S., Sahoo, G.P., and Misra, A., 2016, Highly selective turn-on fluorogenic chemosensor for robust quantification of Zn(II) based on aggregation induced emission enhancement feature, *ACS Sensors*, 1, 739–747.
- Sigurdson, G.T., Robbins, R.J., Collins, T.M., and Giusti, M.M., 2016, Evaluating the role of metal ions in the bathochromic and hyperchromic responses of cyanidin derivatives in acidic and alkaline pH, *Food Chemistry*, 208, 26–34.
- Singh, J., Sharma, M., and Basu, S., 2018, Heavy metal ions adsorption and photodegradation of remazol black XP by iron oxide/silica monoliths: Kinetic and equilibrium modelling, *Advanced Powder Technology*, 29, 2268–2279.
- Sobczyk, L., Grabowski, S.J., and Krygowski, T.M., 2005, Interrelation between H-bond and Pi-electron delocalization, *Chemical Reviews*, 105, 3513–3560.
- Song, X., Yu, M., Niu, H., Li, Y., Chen, C., Zhou, C., Liu, L., and Wu, G., 2024, Poly(methyl dihydroxybenzoate) modified waterborne polyurethane sizing

coatings with chemical and hydrogen-bonded complex cross-linking structures for improving the surface wettability and mechanical properties of carbon fiber, *Progress in Organic Coatings*, 187, 108112.

Sousa, S.F., Fernandes, P.A., and Ramos, M.J., 2007, General performance of density functionals, *The Journal of Physical Chemistry A*, 111, 10439–10452.

Stauffer, S., Coletta, C.J., Tedesco, R., Nishiguchi, G., Carlson, K., Sun, J., Katzenellenbogen, B.S., and Katzenellenbogen, J.A., 2000, Pyrazole ligands: Structure-affinity/activity relationships and estrogen receptor- α -selective agonists, *Journal of Medicinal Chemistry*, 43, 4934–4947.

Subashini, G., Saravanan, A., Shyamsivappan, S., Arasakumar, T., Mahalingam, V., Shankar, R., and Mohan, P.S., 2018, A versatile “on-off-on” quinoline pyrazoline hybrid for sequential detection of Cu^{2+} and S^{2-} ions towards bio imaging and tannery effluent monitoring, *Inorganica Chimica Acta*, 483, 173–179.

Suganya, S., and Kumar, P., 2019, An investigation of adsorption parameters on ZVI-AC nanocomposite in the displacement of Se(IV) ions through CCD analysis, *Journal of Industrial and Engineering Chemistry*, 75, 211–223.

Suma, A.A.T., Wahyuningsih, T.D., and Mustofa., 2019, Synthesis, cytotoxicity evaluation and molecular docking study of N-phenylpyrazoline derivatives, *Indonesian Journal of Chemistry*, 19, 1081–1090.

Suman, G., Bubbly, S., Gudennavar, S., and Gayathri, V., 2019, Benzimidazole and benzothiazole conjugated Schiff base as fluorescent sensors for Al^{3+} and Zn^{2+} , *Journal of Photochemistry and Photobiology A: Chemistry*, 382, 111947.

Suman, G.R., Bubbly, S.G., and Gudennavar, S.B., 2019, Benzimidazole and benzothiazole fluorophores with large Stokes shift and intense sky-blue emission in aggregation as Al^{3+} and Pb^{2+} sensors, *Journal of Luminescence*, 215, 116688.

Susumu, I., Takeshi, N., Nobuyuki, N., Yosiko, S., Hoyuku, N., and Shoji, S., 1995, Antitumorigenic activities of chalcone. I. Inhibitory effects of chalcone derivatives on ^{32}P -incorporation into phospholipids of hela cells promoted by 12-O-tetradecanoyl-phorbol 12-acetate (TPA), *Biological and Pharmaceutical Bulletin*, 18, 1710–1713.

Svoboda, J., and König, B., 2006, Templated photochemistry: Toward catalysts enhancing the efficiency and selectivity of photoreactions in homogenous solutions, *Chemical Reviews*, 106, 5413–5430.

Tarika, J.D.D., Dexlin, X.D.D., Madhankumar, S., Jayanthi, D.D., and Beaula, T.J., 2021, Tuning the computational evaluation of spectroscopic, ELF, LOL, NCI analysis and molecular docking of novel anti COVID-19 molecule 4-dimethylamino pyridinium 3,5-dichlorosalicylate, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 259, 119907.

- Tasior, M., Kim, D., Singha, S., Krzeszewski, M., Ahn, K.H., and Gryko, D.T., 2015, π -Expanded coumarins: Synthesis, optical properties and applications, *Journal of Materials Chemistry C*, 3, 1421–1446.
- Terzyk, A.P., 2004, Molecular properties and intermolecular forces—factors balancing the effect of carbon surface chemistry in adsorption of organics from dilute aqueous solutions, *Journal of Colloid and Interface Science*, 275, 9–29.
- Tewari, A.K., and Dubey, R., 2008, Emerging trends in molecular recognition: Utility of weak aromatic interactions, *Bioorganic & Medicinal Chemistry*, 16, 126–143.
- Tigreros, A., and Portilla, J., 2020, Recent progress in chemosensors based on pyrazole derivatives, *RSC Advances*, 10, 19693–19712.
- Tipping, E., Rey-Castro, C., Bryan, S.E., and Hamilton-Taylor, J., 2002, Al(III) and Fe(III) binding by humic substances in freshwaters, and implications for trace metal speciation, *Geochimica et Cosmochimica Acta*, 66, 3211–3224.
- Tran, N., Drogui, P., and Brar, S.K., 2015, Sonochemical techniques to degrade pharmaceutical organic pollutants, *Environmental Chemistry Letters*, 13, 251–268.
- Upadhyay, S., Singh, A., Sinha, R., Omer, S., and Negi, K., 2019, Colorimetric chemosensors for d-metal ions: A review in the past, present and future prospect, *Journal of Molecular Structure*, 1193, 89–102.
- Vahedpour, T., Mivehroud, M.H., Hemmati, S., and Dastmalchi, S., 2021, Synthesis of 2-pyrazolines from hydrazines: Mechanisms explained, *ChemistrySelect*, 6, 6483 –6506.
- Vennila, S., Deepa, K., Nagaraja, K.S., Lakshmi, L., Selvaraj, S., and Karnan, C., 2024, Synthesis, structural, spectral, Anticancer activity, and density functional theory investigations of 2-[hydrazinylidene(phenyl)methyl] pyridine, *Journal of Molecular Structure*, 1316, 138832.
- Vijayakumar, T., Joe, I.H., Nair, C.P.R., and Jayakumar, V.S., 2008, Efficient π electrons delocalization in prospective push–pull non-linear optical chromophore 4-[N,N-dimethylamino]-4'-nitro stilbene (DANS): A vibrational spectroscopic study, *Chemical Physics*, 343, 83–99.
- Wade, D., 1999, Deuterium isotope effects on noncovalent interactions between molecules, *Chemico-biological Interactions*, 117, 191–217.
- Wahyuningsih, T.D., Suma, A.A.T., Stansyah, Y.M., and Astuti, E., 2022, Synthesis, biological evaluation and molecular docking of methoxy n-phenylpyrazoline derivatives as anticancer agents, *Pakistan Journal of Pharmaceutical Sciences*, 35, 965-972
- Wang, J., Chen, L., Li, Y., Shen, W., and Manley-Harris, M., 2024, A novel determination method for Ag(I) in environmental samples based on

- reduction of absorbance and fluorescence quenching of Eosin Y, *Microchemical Journal*, 196, 109588.
- Wang, K., Liu, Z., Guan, R., Cao, D., Chen, H., Shan, Y., Wu, Q., and Xu, Y., 2015, Coumarin benzothiazole derivatives as chemosensors for cyanide anions, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 144, 235–242.
- Wang, L., Yang, X., Zhang, Y., Chen, R., Cui, Y., and Wang, Q., 2019, Anti-inflammatory chalcone-isoflavone dimers and chalcone dimers from *Caragana jubata*, *Journal of natural products*, 82, 2761–2767.
- Wang, S.Q., Liu, S.Y., Wang, H.Y., Zheng, X.X., Yuan, X., Liu, Y.Z., Miao, J.Y., and Zhao, B.X., 2014, Novel pyrazoline-based selective fluorescent sensor for Hg^{2+} , *Journal of Fluorescence*, 24, 657–663.
- Wang, Y., Cao, R., Wang, M., Liu, X., Zhao, X., Lu, Y., Feng, A., and Zhang, L., 2020, Design and synthesis of phenyl silicone rubber with functional epoxy groups through anionic copolymerization and subsequent epoxidation, *Polymer*, 186, 122077.
- Wever, D.H., and Verachtert, H., 1997, Biodegradation and toxicity of benzothiazoles, *Water Research*, 31, 2673–2684.
- Williams, R.T., and Bridges, J.W., 1964, Fluorescence of solutions: A review, *Journal of Clinical Pathology*, 17, 371–394.
- Wu, X., Xu, B., Tong, H., and Wang, L., 2011, Highly selective and sensitive detection of cyanide by a reaction-based conjugated polymer chemosensor, *Macromolecules*, 44, 4241–4248.
- Wu, Y., and Zhu, W., 2013, Organic sensitizers from D– π –A to D–A– π –A: Effect of the internal electron-withdrawing units on molecular absorption, energy levels and photovoltaic performances, *Chemical Society Reviews*, 42, 2039–2058.
- Xu, J.H., Hou, Y.M., Ma, Q.J., Wu, X.F., and Wei, X.J., 2013, A highly selective fluorescent sensor for Fe^{3+} based on covalently immobilized derivative of naphthalimide, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 112, 116–124.
- Xue, H.B., Stumm, W., and Sigg, L., 1988, The binding of heavy metals to algal surfaces, *Water Research*, 22, 917–926.
- Yalkowsky, S.H., and Alantary, D., 2018, Estimation of melting points of organics, *Journal of Pharmaceutical Sciences*, 107, 1211–1227.
- Yang, X., Cui, Y., Zhao, N., Wang, S., Yan, H., and Han, D., 2024, Magnetic molecularly imprinted polymers integrated ionic liquids for targeted detecting diamide insecticides in environmental water by HPLC-UV following MSPE, *Talanta*, 270, 125620.

- Yang, Y., Gou, X., Blecha, J., and Cao, H., 2010, A highly selective pyrene based fluorescent sensor toward Hg^{2+} detection, *Tetrahedron Letters*, 51, 3422–3425.
- Ye, F.Y., Hu, M., and Zheng, Y.S., 2023, Advances and challenges of metal ions sensors based on AIE effect, *Coordination Chemical Reviews*, 493, 215328.
- Yousif, E., and Hasan, A., 2015, Photostabilization of poly(vinyl chloride) – Still on the run, *Journal of Taibah University for Science*, 9, 421–448.
- Yu, Q., Li, X., Shen, C., Yu, Z., Guan, J., and Zheng, J., 2024, Blue-shifted and broadened fluorescence enhancement by visible and mode-selective infrared double excitations, *Journal of Physical Chemistry A*, 128, 2912–2922.
- Zhang, H., Jiang, X., Wu, W., and Mo, Y., 2016, Electron conjugation: Versus π - π Repulsion in substituted benzenes: Why the carbon-nitrogen bond in nitrobenzene is longer than in aniline, *Physical Chemistry Chemical Physics*, 18, 11821–11828.
- Zhang, H., Liu, J., Li, M., and Yang, B., 2018, Functional groups in geminal imidazolium ionic compounds and their influence on thermo-physical properties, *Journal of Molecular Liquids*, 269, 738–745.
- Zhang, Y., Ding, C., Li, C., and Wang, X., 2021, Advances in fluorescent probes for detection and imaging of amyloid- β peptides in Alzheimer's disease, *Advances in Clinical Chemistry*, 103, 135–190.
- Zhu, G., Cheng, G., Wang, L., Yu, W., Wang, P., and Fan, J., 2019, A new ionic liquid surface-imprinted polymer for selective solid-phase-extraction and determination of sulfonamides in environmental samples, *Journal of Separation Science*, 42, 725–735.