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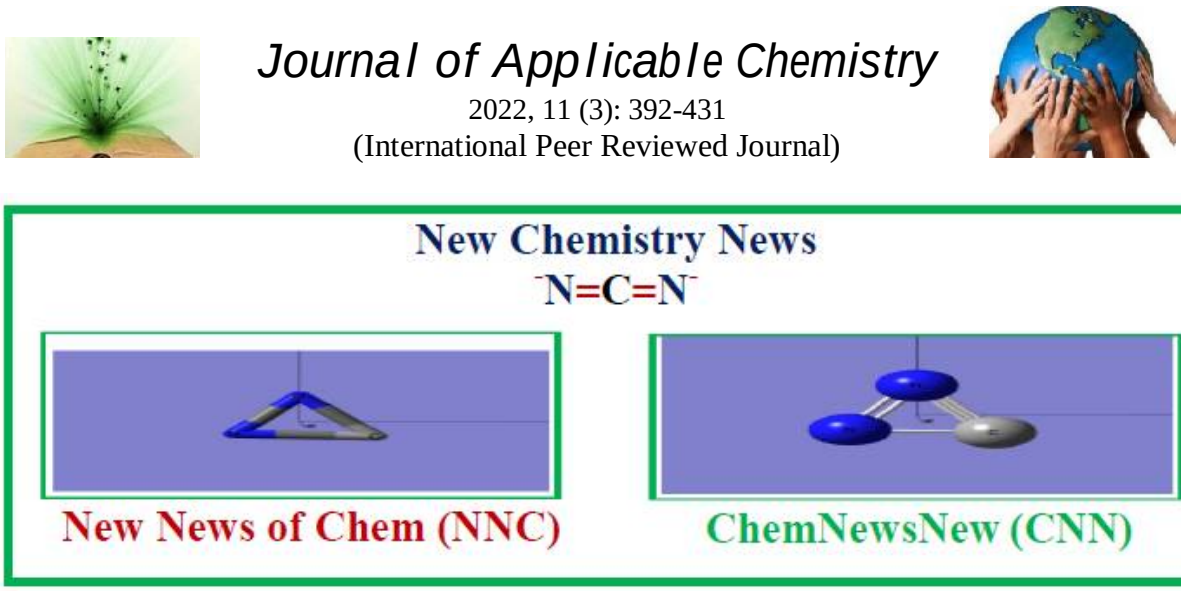
(International Peer Reviewed Journal)



CNN – 45
Chalcogenbonds

Information Source	ACS.org ; sciencedirect.com
K. Somasekhara Rao, Dept. of Chemistry, Acharya Nagarjuna Univ., Dr. M.R.Appa Rao Campus, Nuzvid-521 201, India	R. Sambasiva Rao, School of Chemistry, Andhra University, Visakhapatnam 530 003, India

Conspectus: Chalcogen atoms ([ChA: [O, S, Se, Te, Po Lv]) belong to 16th group of 18 column chemical elements periodic table. ChA exhibits Lewis's acid (LA) behaviour and forms complexes or adducts with Lewis bases (LB) including molecules or specieswith π electron systems. The Chalcogen (like triel, tetrel, pnicogen, halogen, hydrogen) bond is also understood in terms of the σ-hole concept proposed by Politzer and Murray.

Knowledge based work-flows have beenfocus of our investigations of speciation in different phases and environments evolving in trans-disciplinary chemical sciences.

Keywords:Interactions; Physics; Chemistry-Biology; Bonds; No-Bonds; Chemical bonds (CB); Electrovalent-B; Covalent Bond (CovB); Non-Covalent Chemical bonds (NCCB): [Nobel gas (aerogen), Halogen,Chalcogen, Pnicogen (or Pnictogen), Tetrel, Triel , Spodium, Regium (or Coinage), alkali, alkaline earth, Hydrogen [{strong, weak}, dihydrogen, hydride]], Synthesis, spectroscopy, computational quantum chemistry, Molecular dynamics

	Layout	
I	Chalcogen bonds in chemical systems	K(nowledge)Lab rsr.chem1979
II	Select Research Titles from ACS (American Chemical Society)	
III	Select Research Titles from SD (Science Direct)	

I. Chalcogen bonds in Chemical systems

Column#	Abbrev	Abbrev	$$ bonds
	$$Bond	$$Atom	
1G	HB	HA	Hydrogen
18G	NgB	NgA	Nobel gas
17G @	HaB	HaA	Halogen

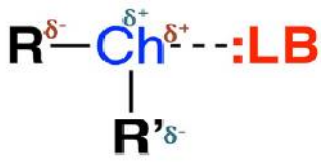
16G @	ChB	ChA	Chalcogen

15G	PnB	PnA	Pnicogen or Pnictogen
14G	TtB	TtA	Tetrel
13G	TrB	TrA	Triel
12G	SPB	SPA	Spodium
11G	CiB or RgB	CiA or RgA	Regium or Coinage
2G	AEB AlkEarB	AEB AlkEarA	Alkaline-Earth
1G	AkB AlkB	AkA AlkA	Alkaline

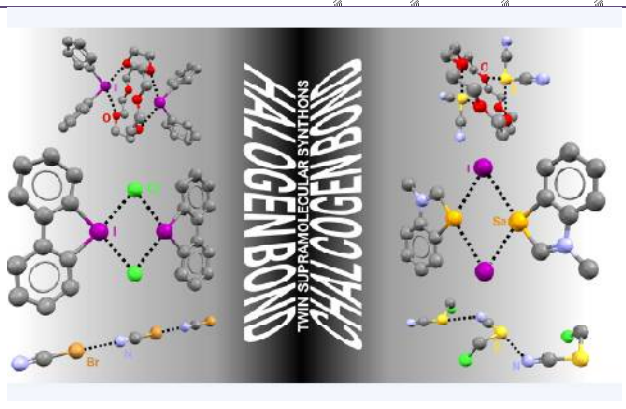
☞ A Chalcogenbond is defined as an interaction between any electron donating moiety and a group 16 element (ChA) acting as Lewis acid

Ch bond formation	
Chalcogen bonds	Def ✓ Chalcogens behave as acceptors of electron density ✓ X-Chal · · ·Y bonding types ✓ XdChal · · ·Y bonding types
	Very much like those of the halogen bond because of the similar misshaped electron clouds of the chalcogen atom and the halogen atom
Chalcogen bond formation detected by	☞ Bond-length change ☞ Interaction energy ☞ Topological property ☞ Electron charge density and its Laplacian ☞ Charge transfer of the chalcogen bond
Expt. evidence for chalcogen bond	Crystal structure experiments ☞ Agreement with the theoretical/computational results ☞ Existence of the chalcogen bond with the type of xdchal· · ·y ☞ Contraction of the XdChal bond upon complex

Chalcogen Bond ChB. ACS. **20**

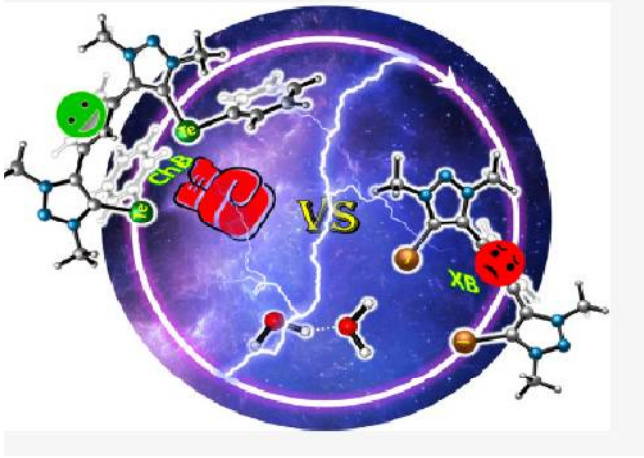


Chalcogen Bond **rev** ChB. ACS. **46**



Chalcogen Bond (Te , Se)

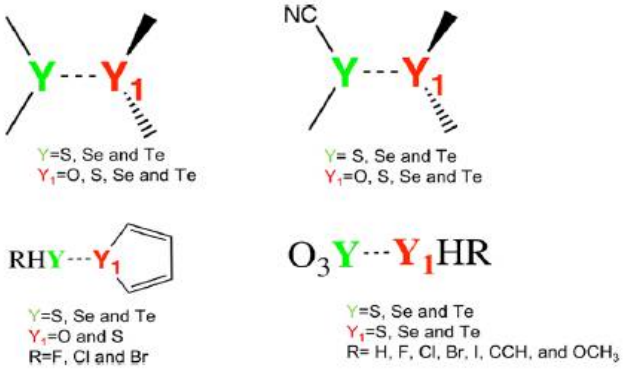
ChB. ACS. 17



Chalcogen Bond

ChB. ACS. 20

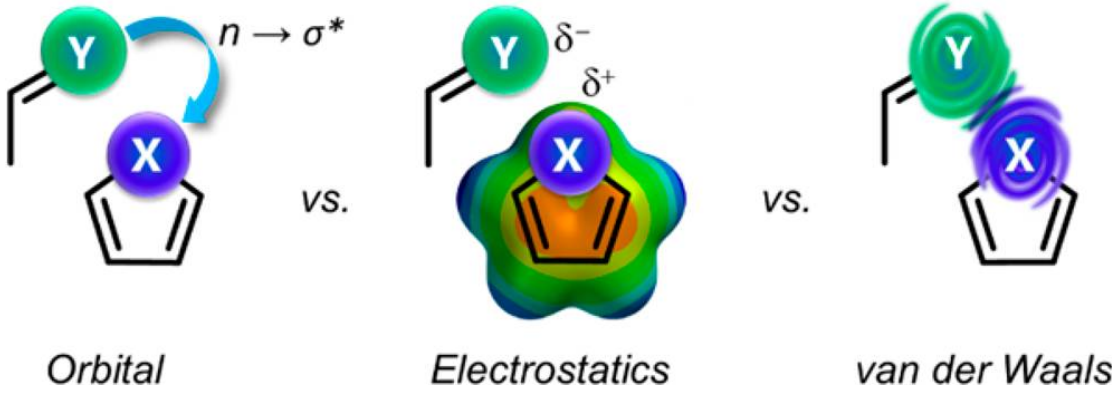
Lewis structures of model CHAL–CHAL systems



Chalcogen Bond [S se]

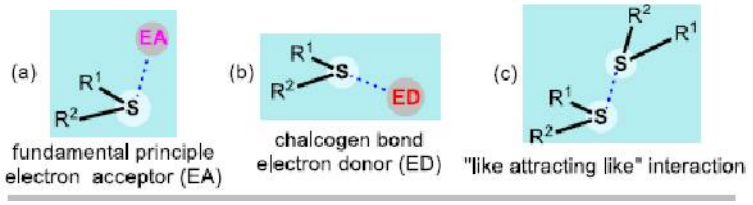
ChB. ACS. 59

Non-covalent bonding



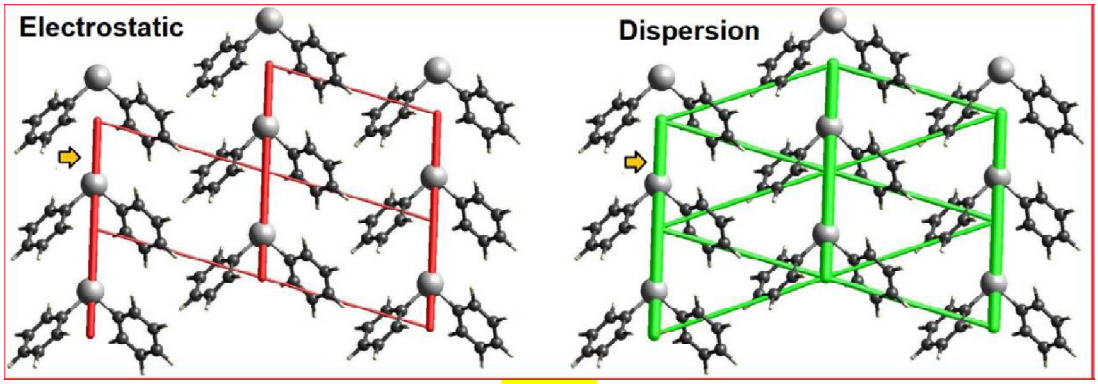
Chalcogen Bond (S ; Se)		ChB.	ACS.	39

S



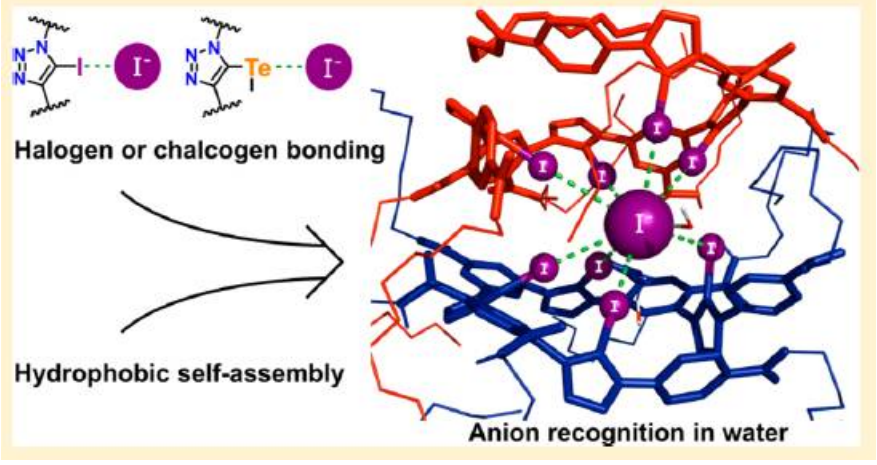
Chalcogen Bond [S Se Te]	CSD	ChB.	ACS.	54

Partitioned energy framework
(electrostatic and dispersive components)

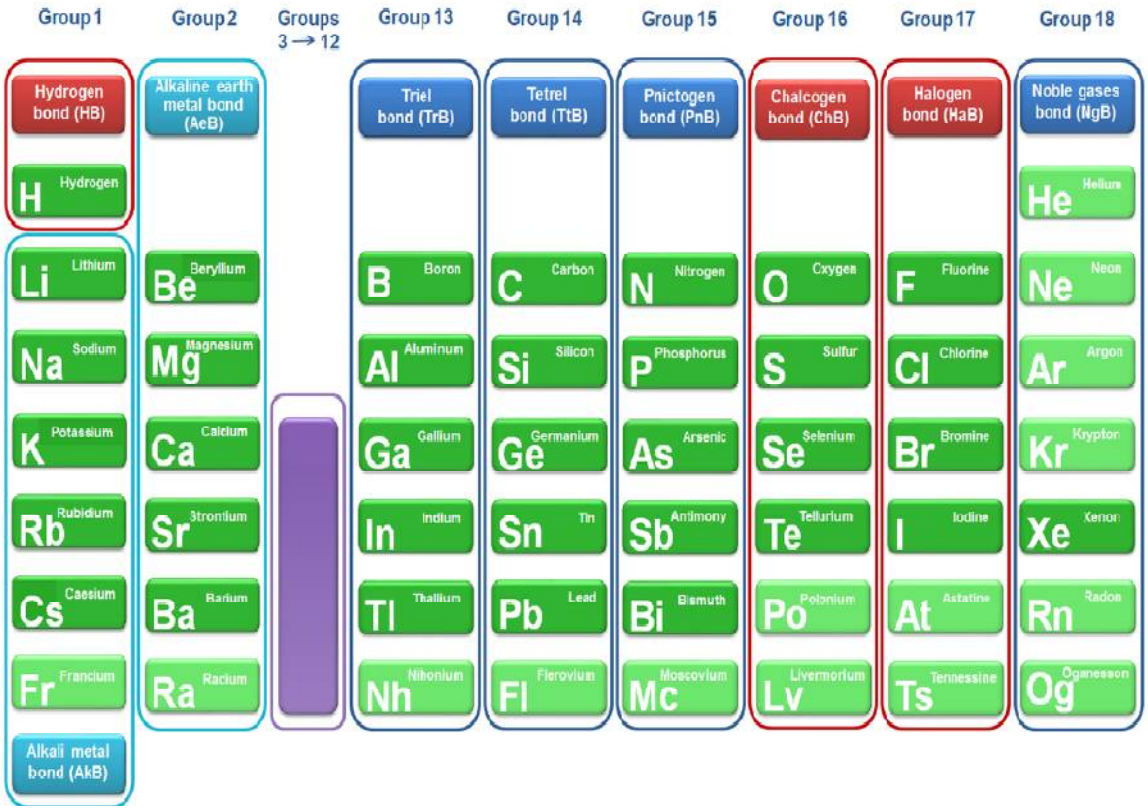


Ph2Te

Chalcogen Bond	+ HaB	ChB Chem Rev.	ACS.	48



Comp Quan Chem (CQC)		
Geom opt frequency computations	Gaussian 03	
MP2	Theory level	
Dunning's correlation consisted aug-cc-pVTZ	Basis sets	
Interactionenergies ESP	MP2/aug-cc-pVTZ	
Basis set superposition error (BSSE)	Eliminated by standard counterpoise (CP) correction method of Boys and Bernardi	
AIM	AIM2000 software	MP2/aug-cc-pVTZ wave functions as input
Bader's "atoms in molecules" (AIM) theory	Bonding characteristic of the S · · · Cl contact	
Natural bond orbital (NBO) theory of Weinhold et. al.	NBO analysis built-in subroutines of Gaussian 03 MP2-optimized structures Hartree-Fock (HF) densities	



Coutesy from DOI: 10.1021/acs.accounts.9b00037

Term recommended by IUPAC

The term is used in the literature consistent with the proposed classification

Other cases

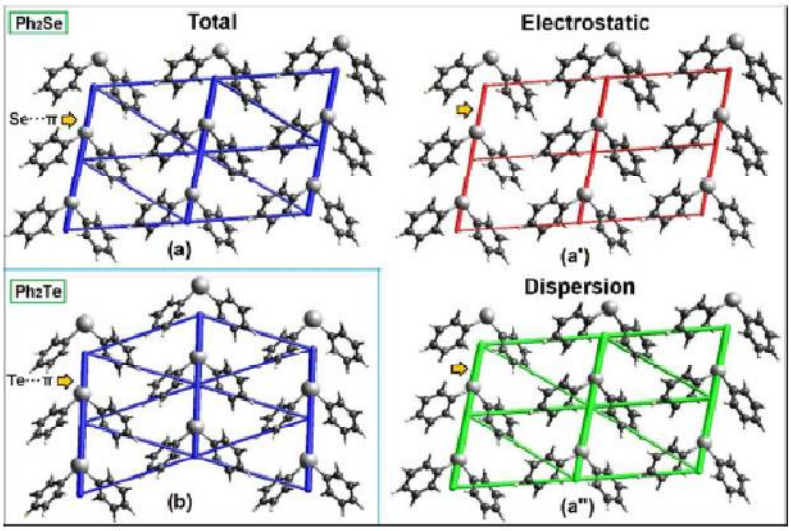
Experimental and theoretical evidences are reported for the formation of non-covalent adducts wherein the element is the electrophile

The electrophilic character of the element has been predicted by modelling or can be anticipated by analogy. The assigned color code for the elements is provisional; a comprehensive search of the literature may enable for a change from light green to green

Ch [S Se Te] B +
π interactions

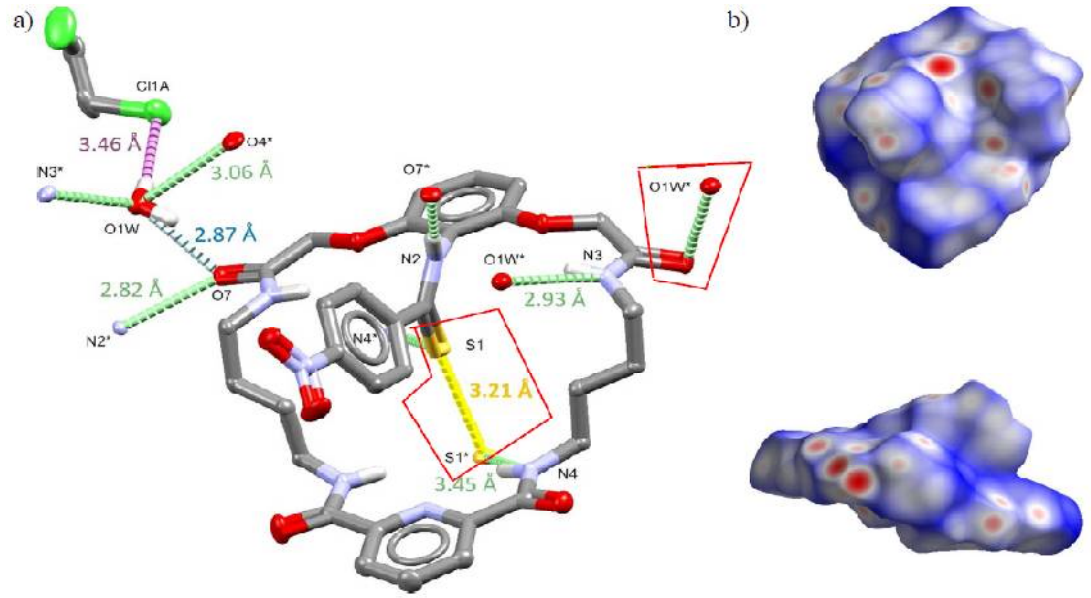
Chalcogen Bond [S Se Te]	**CSD**	ChB.	ACS.	**54**

Chalcogen · · · π interactions (Ph2Se, Ph2Te) (Yellow arrows)

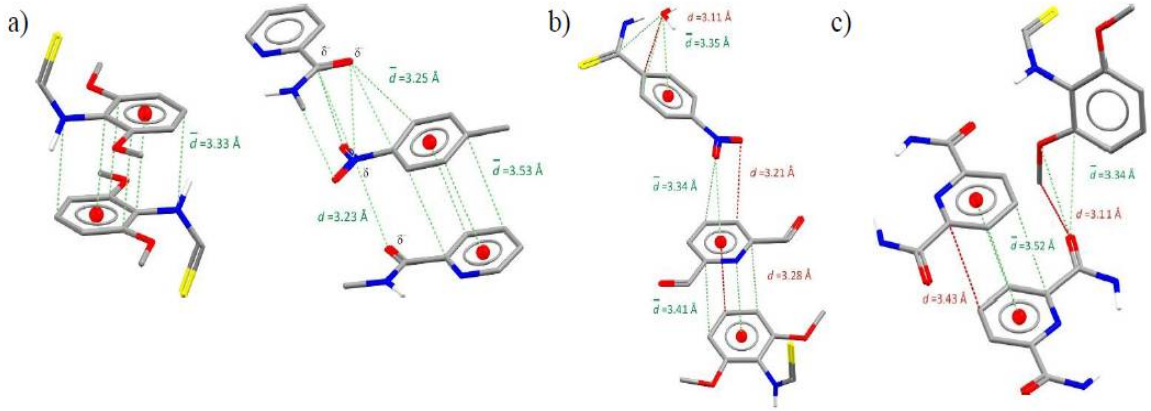


Crystal structure of 4c · 0.75H2O · 2DCE

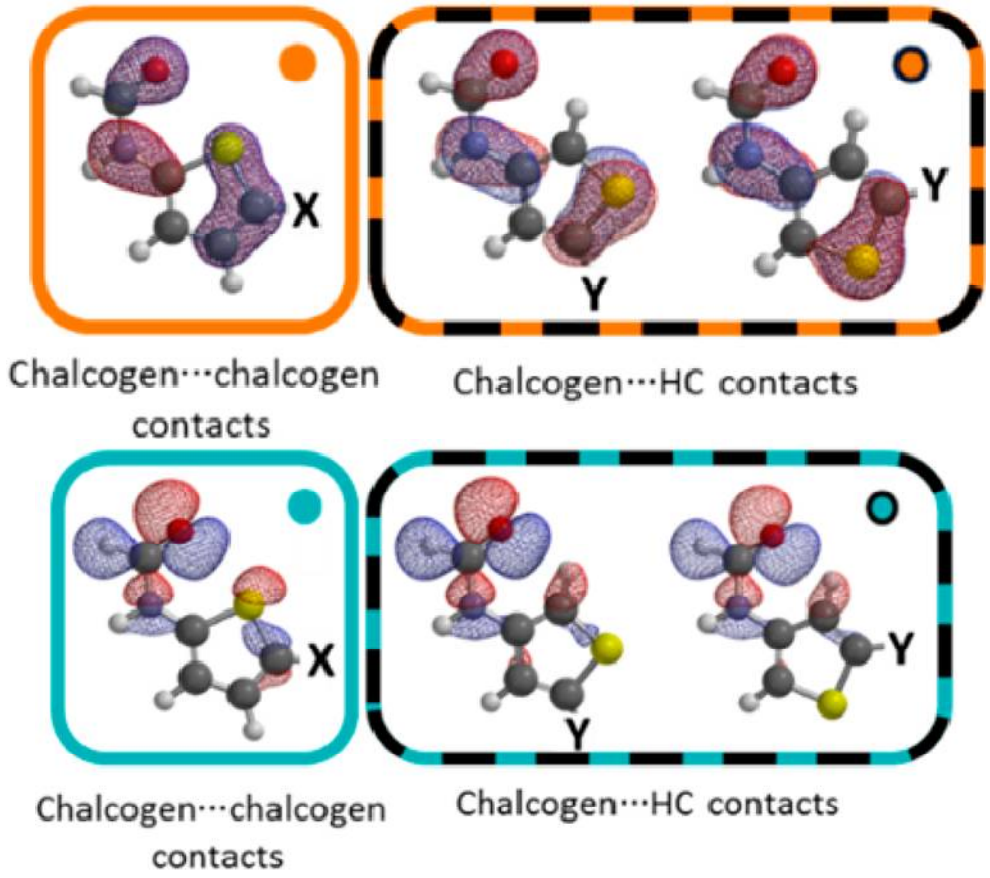
Front- and side-view of Hirshfeld surface



CH···π and π···π local interactions
Complementary dipoles for 4b7 (a), 4c·0.75H2O·DCE (b), and 4d (c)

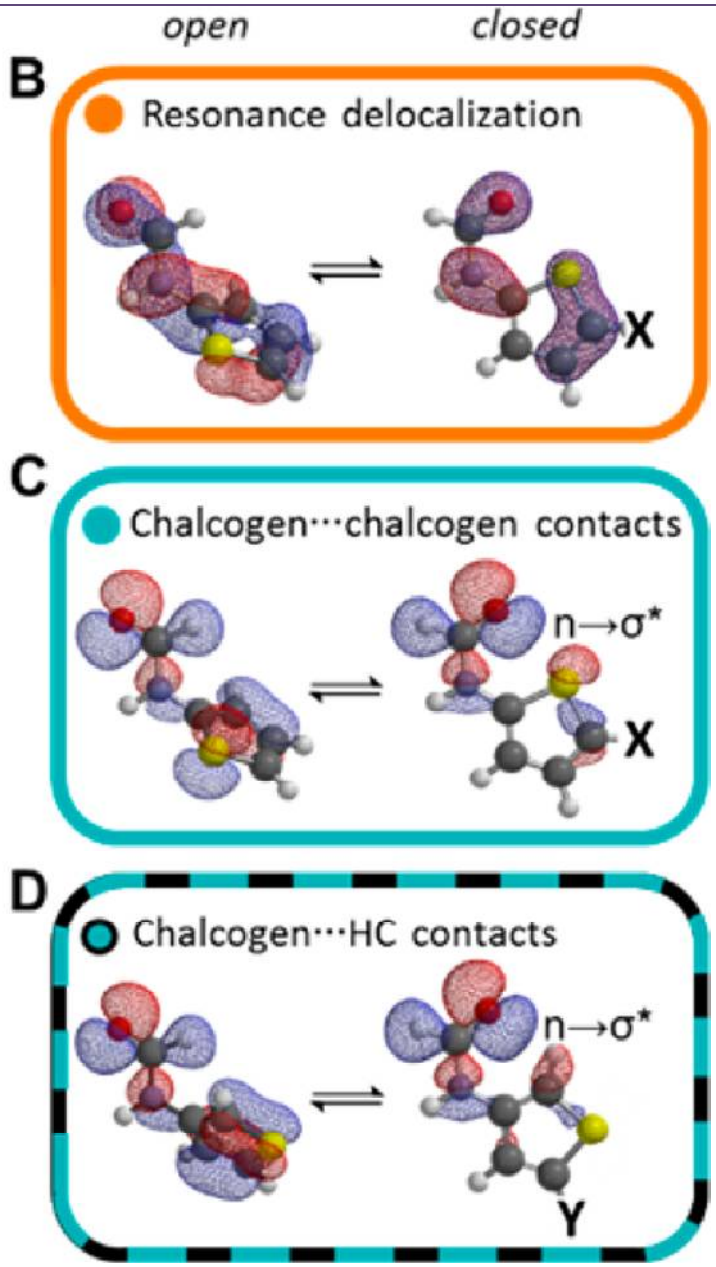


Chalcogen Bond [S se]		ChB.	ACS.	59

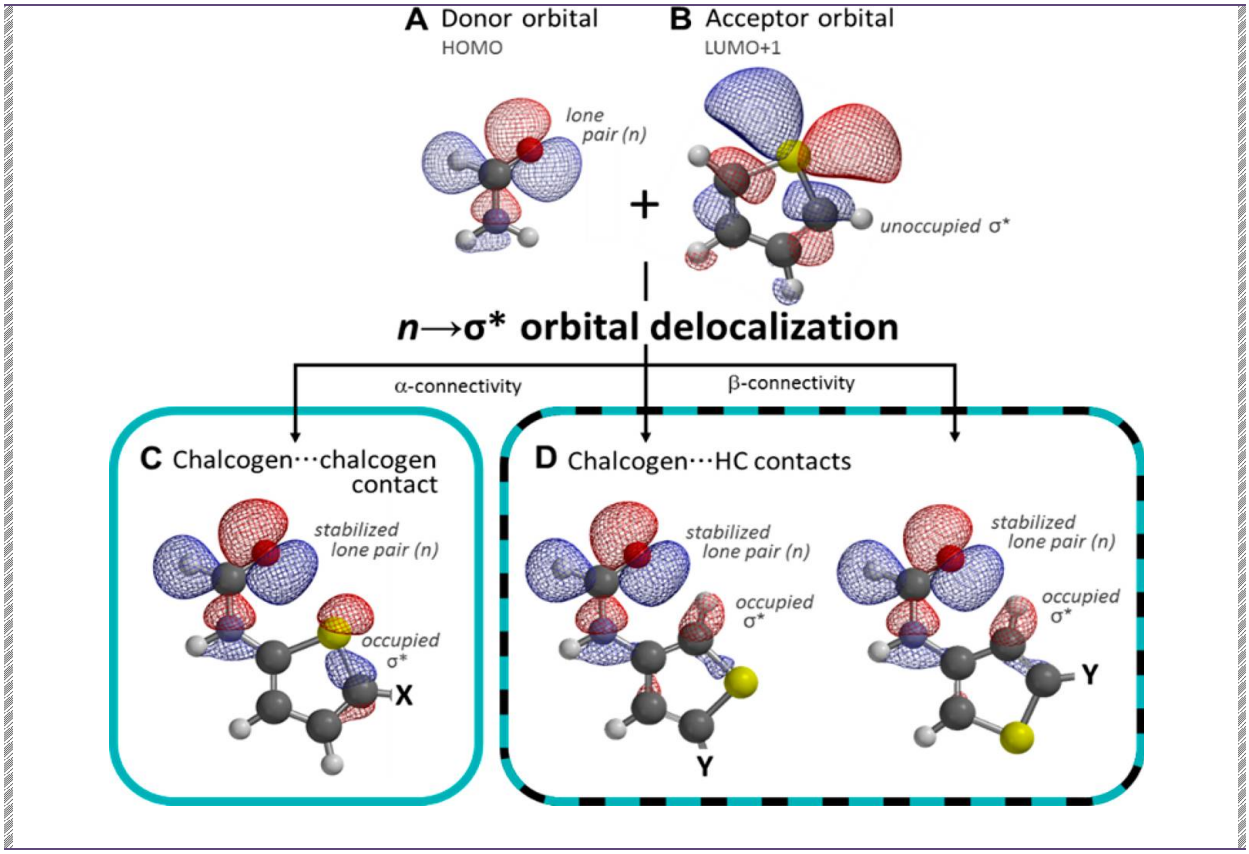


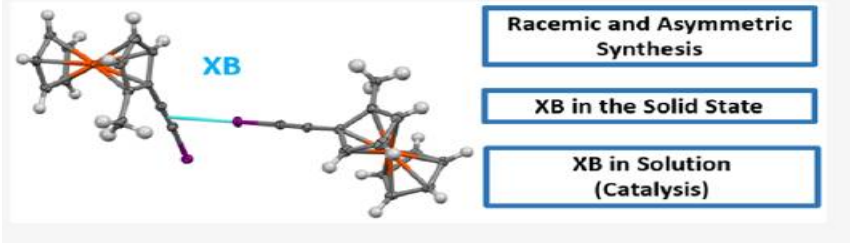
Chalcogen Bond [S se]		ChB.	ACS.	59

M06-2X/
6-311G* and ωB97X-D/6-311G*



Orbital decomposition analysis
Chalcogen-bonding





II. Select Research Titles from American Chemical Society Journals

Principles Guiding the Square Bonding Motif Containing a Pair of Chalcogen Bonds between Chalcogenadiazoles	The Journal of Physical Chemistry A, Articles ASAP (A: Structure, Spectroscopy, and Reactivity of Molecules and Clusters) DOI: 10.1021/acs.jpca.1c10818
Steve Scheiner	

Predictability of Chalcogen-Bond-Driven Crystal Engineering: An X-ray Diffraction and Selenium-77 Solid-State NMR Investigation of Benzylic Selenocyanate Cocrystals	ACS Organic & Inorganic Au, Articles ASAP (Article)2022. DOI: 10.1021/acsorginorgau.1c00051
Vijith Kumar,Vincent M. Morin,David L. Bryce	
ChB. ACS. 02	

Carbon-chalcogen bond in organosilicon pseudohalides	Inorganic Chemistry 1975, 14, 3, 573-575 (Article) DOI: 10.1021/ic50145a026
Joel A. Seckar and John S. Thayer	
ChB. ACS. 03	

Cooperativity of Halogen- and Chalcogen-Bonding Interactions in the Self-Assembly of 4-Iodoethynyl- and 4,7-Bis(iodoethynyl)benzo-2,1,3-chalcogenadiazoles: Crystal Structures, Hirshfeld Surface Analyses, and Crystal Lattice Energy Calculations	Crystal Growth & Design 2022, 22, 2, 1299-1311 (Article) DOI: 10.1021/acs.cgd.1c01266
Jan Alfuth, Beata Zadykowicz, Barbara Wicher, Katarzyna Kazimierczuk, Tadeusz ołoński and Teresa Olszewska	
ChB. ACS. 04	

Harnessing Intramolecular Chalcogen–Chalcogen Bonding in Merocyanines for Utilization in High-Efficiency Photon-to-Current Conversion Optoelectronics	ACS Applied Materials & Interfaces 2022, 14, 3, 4360-4370 (Organic Electronic Devices)DOI: 10.1021/acsami.1c16950
Hyeong-Ju Kim, In-Sun Jung, Seyoung Jung, Dongmin Kim, Daiki Minami, Sunjungyun, Taejin Choi, Jisoo Shin, Sungyoung Yun, Chul-Joon Heo, Kyung-Bae Park, Soo Young Park, Seon-Jeong Lim, Hyo Sug Lee and Byoungki Choi	
ChB. ACS. 05	

A Porous Chalcogen-Bonded Organic Framework	Journal of the American Chemical Society 2021, 143, 48, 20207-20215 (Article) DOI: 10.1021/jacs.1c08642
Brian J. Eckstein, Loren C. Brown, Bruce C. Noll, Michael P. Moghadasnia, Gary J. alaich, and C. Michael McGuirk	
ChB. ACS. 06	

Design of Azobenzene beyond Simple On–Off Behavior	Journal of the American Chemical Society 2021, 143, 47, 19856-19864 (Article) DOI: 10.1021/jacs.1c09090
Saber Mehrparvar, Zoe Nonie Scheller, Christoph Wölper, and GebhardHaberhauer	
ChB. ACS. 07	

Adducts of 2-Pyridylselenenyl Halides and Nitriles as Novel Supramolecular Building Blocks: Four-Center Se···N Chalcogen Bonding versus Other Weak Interactions	Crystal Growth & Design 2022, 22, 1, 313-322 (Article) DOI: 10.1021/acs.cgd.1c00954

Mariya V. Grudova, Victor N. Khrustalev, Alexey S. Kubasov, Pavel V. Strashnov, Zhanna V. Matsulevich, Julia M. Lukiyanova, Galina N. Borisova, Andreii S. Kritchenkov, Maria M. Grishina, Alexey A. Artemjev, Ivan V. Buslov, Vladimir K. Osmanov, Valentine G. Nenajdenko, Nguyen Q. Trung, Alexander V. Borisov, and Alexander G. Tskhovrebov			
	ChB.	ACS.	08

Iso-Tellurazolium-N-Phenoxides: A Family of Te···O Chalcogen-Bonding Supramolecular Building Blocks	Inorganic Chemistry 2021, 60, 21, 16726-16733 (Article)DOI: 10.1021/acs.inorgchem.1c02585		
Peter C. Ho, Valerie Tomassetti, James F. Britten, and Ignacio Vargas-Baca*			
	ChB.	ACS.	09

Triptycene-Based Porous Chalcogen-Bonded Organic Frameworks	Crystal Growth & Design 2021, 21, 11, 6497-6503 (Article) DOI: 10.1021/acs.cgd.1c00942		
Wei Yang*Rong Jiang, Chao Liu, Baoqiu Yu, Xue Cai*, and Hailong Wang			
	ChB.	ACS.	10

Bis-selenonium Cations as Bidentate Chalcogen Bond Donors in Catalysis	ACS Catalysis 2021, 11, 20, 12632-12642 (Research Article) DOI: 10.1021/acscatal.1c03622		
Xinxin He, Xinyan Wang, Ying-Lung Steve Tse, ZhihaiKe and Ying-Yeung Yeung			
	ChB.	ACS.	11

Metal-Involving Chalcogen Bond. The Case of Platinum(II) Interaction with Se/Te-Based σ-Hole Donors	Journal of the American Chemical Society 2021, 143, 38, 15701-15710 (Article) DOI: 10.1021/jacs.1c06498		
Anton V. Rozhkov, Eugene A. Katlenok, Margarita V. Zhmykhova, Alexander Yu. Ivanov, Maxim L. Kuznetsov, Nadezhda A. Bokach, and Vadim Yu. Kukushkin			
	ChB.	ACS.	12

Charge Assisted S/Se Chalcogen Bonds in SAM Riboswitches: A Combined PDB and ab Initio Study	ACS Chemical Biology 2021, 16, 9, 1701-1708 (Articles) DOI: 10.1021/acschembio.1c00417		
María de las Nieves Piña, Antonio Frontera, and Antonio Bauza			
	ChB.	ACS.	13

Development of a Fluorophore with Enhanced Unorthodox Chalcogen Bonding for Highly Sensitive Detection of Trimethyl Arsine Vapor	ACS Sensors 2021, 6, 8, 2851-2857 (Letter) DOI: 10.1021/acssensors.1c01185		
Linfeng Cui, Yanjun Gong, Xinting Yu, ChunxiaoLv, Xiaoming Du, Jincai Zhao , and Yanke Che			
	ChB.	ACS.	14

Heisenberg Spin Chains via Chalcogen Bonding: Noncovalent S···O Contacts Enable Long-Range Magnetic Order	Inorganic Chemistry 2021, 60, 15, 11338-11346 (Article) DOI: 10.1021/acs.inorgchem.1c01287		
R. Alex Mayo, Ian S. Morgan, Dmitriy V. Soldatov, Rodolphe Clérac*, and Kathryn E. Preuss			
	ChB.	ACS.	15

Lewis Acidic Telluronium Cations: Enhanced Chalcogen-Bond Donor Properties and Application to Transfer Hydrogenation Catalysis	Organometallics 2021, 40, 15, 2371-2374 (Communication) DOI: 10.1021/acs.organomet.1c00279
Benyu Zhou and François P. Gabbaï	
	ChB. ACS. 16

Chalcogen vs Halogen Bonding Catalysis in a Water-Bridge-Cocatalyzed Nitro-Michael Reaction	The Journal of Organic Chemistry 2022, 87, 3, 1661-1668 (Article) DOI: 10.1021/acs.joc.1c00894
NazihaTarannam, Martin H. H. Voelkel, Stefan M. Huber and Sebastian Kozuch	
	ChB. ACS. 17

Anion Chelation via Double Chalcogen Bonding: The Case of a Bis-telluronium Dication and Its Application in Electrophilic Catalysis via Metal–Chloride Bond Activation	Journal of the American Chemical Society 2021, 143, 23, 8625-8630 (Communication) DOI: 10.1021/jacs.1c04482
Benyu Zhou and François P. Gabbaï	
	ChB. ACS. 18

Invariant and Variable Supramolecular Self-Assembly in 6-Substituted Uracil Derivatives: Insights from X-ray Structures and Quantum Chemical Study	Crystal Growth & Design 2021, 21, 6, 3234-3250 (Article) DOI: 10.1021/acs.cgd.0c01583
Lamya H. Al-Wahaibi, Sai Ramya SreeBysani, Samar S. Tawfik, Mohammed S. M. Abdelbaky, Santiago Garcia-Granda, Ali A. El-Emam, M. Judith Percino, and Subbiah Thamotharan	
	ChB. ACS. 19

CHAL336 Benchmark Set: How Well Do Quantum-Chemical Methods Describe Chalcogen-Bonding Interactions?	Journal of Chemical Theory and Computation 2021, 17, 5, 2783-2806 (Quantum Electronic Structure) DOI: 10.1021/acs.jctc.1c00006
Nisha Mehta, Thomas Fellowes, Jonathan M. White, Lars Goerigk	
	ChB. ACS. 20

Synthesis of 4-Selanyl- and 4-Tellanyl-1H-isochromen-1-ones Promoted by Diorganyl Dichalcogenides and Oxone	The Journal of Organic Chemistry 2021, 86, 20, 14016-14027 (Article) DOI: 10.1021/acs.joc.1c00271
Helen A. Goulart, José S. S. Neto, Angelita M. Barcellos, Krigor B. Silva, Maiara C. de Moraes, Raquel G. Jacob, Eder J. Lenardão, Thiago Barcellos, and GelsonPerin	
	ChB. ACS. 21

Bandgap Tuning in Molecular Alloy Crystals Formed by Weak Chalcogen Interactions	The Journal of Physical Chemistry Letters 2021, 12, 12, 3059-3065 (Physical Insights into Materials and Molecular Properties) DOI: 10.1021/acs.jpclett.1c00614
Sajesh P. Thomas, Reshmi Thomas, Thomas Bjørn E. Grønbech, Martin Bondesgaard, Aref H. Mamakhel, Victoria Birkedal, and Bo B. Iversen	
	ChB. ACS. 22

Supramolecular Self-Assembly Built by Weak Hydrogen, Chalcogen, and Unorthodox Nonbonded Motifs in 4-(4-Chlorophenyl)-3-[(4-fluorobenzyl)sulfanyl]-5-(thiophen-2-yl)-4H-1,2,4-triazole, a Selective COX-2 Inhibitor: Insights from X-ray and Theoretical Studies	ACS Omega 2021, 6, 10, 6996-7007 (Article) DOI: 10.1021/acsomega.0c06287
Lamya H. Al-Wahaibi, Bavanandan Rahul, Ahmed A. B. Mohamed, Mohammed S. M. Abdelbaky, Santiago Garcia-Granda, Ali A. El-Emam, M. Judith Percino and Subbiah Thamotharan	
ChB. ACS. 23	

Chalcogen versus Dative Bonding in [SF3]+ Lewis Acid–Base Adducts: [SF3(NCCH3)2]+, [SF3(NC5H5)2]+, and [SF3(phen)]+ (phen = 1,10-phenanthroline)	Inorganic Chemistry 2021, 60, 6, 3893-3901 (Article) DOI: 10.1021/acs.inorgchem.0c03679
Douglas Turnbull, Praveen Chaudhary, Paul Hazendonk, Stacey D. Wetmore and Michael Gerken	
ChB. ACS. 24	

Zinc and Cadmium Complexes of Chelating N-Heterocyclic Silylene and Their Reactivity toward Elemental Chalcogens	Inorganic Chemistry 2021, 60, 18, 13861-13868 (Forum Article) DOI: 10.1021/acs.inorgchem.0c03609
Xiaofei Sun, Celine Röder and Peter W. Roesky	
ChB. ACS. 25	

Conformational Control in Dirhodium(II) Paddlewheel Catalysts Supported by Chalcogen-Bonding Interactions for Stereoselective Intramolecular C–H Insertion Reactions	ACS Catalysis 2021, 11, 2, 568-578 (Research Article) DOI: 10.1021/acscatal.0c03689
Takuya Murai, Wenjie Lu, Toshifumi Kuribayashi, Kazuhiro Morisaki, Yoshihiro Ueda, Shohei Hamada, Yusuke Kobayashi, Takahiro Sasamori, NorihiroTokitoh, Takeo Kawabata and Takumi Furuta	
ChB. ACS. 26	

Understanding Reactivity and Assembly of Dichalcogenides: Structural, Electrostatic Potential, and Topological Analyses of 3H-1,2-Benzodithiol-3-one and Selenium Analogs	Crystal Growth & Design 2020, 20, 12, 7704-7725 (Article) DOI: 10.1021/acs.cgd.0c00961
Rahul Shukla, Arun Dhaka, Emmanuel Aubert, Vishnu Vijayakumar-Syamala, Olivier Jeannin, Marc Fourmigué, and Enrique Espinosa	
ChB. ACS. 27	

Understanding Reactivity and Assembly of Dichalcogenides: Structural, Electrostatic Potential, and Topological Analyses of 3H-1,2-Benzodithiol-3-one and Selenium Analogs	Crystal Growth & Design 2020, 20, 12, 7704-7725 (Article) DOI: 10.1021/acs.cgd.0c00961
Rahul Shukla, Arun Dhaka, Emmanuel Aubert, Vishnu Vijayakumar-Syamala, Olivier Jeannin, Marc Fourmigué and Enrique Espinosa	
ChB. ACS. 28	

Disubstituted FerrocenylIodo- and Chalcogenoalkynes as Chiral Halogen and Chalcogen Bond Donors	Organometallics 2020, 39, 21, 3936-3950 (Article) DOI: 10.1021/acs.organomet.0c00633
Victor Mamane, Paola Peluso, Emmanuel Aubert, Robin Weiss, Emmanuel Wenger, Sergio Cossu, and Patrick Pale	
ChB. ACS. 29	

Chalcogen-Bonded Cocrystals of Substituted Pyridine N-Oxides and Chalcogenodiazoles: An X-ray Diffraction and Solid-State NMR Investigation	Crystal Growth & Design 2020, 20, 12, 7910-7920 (Article) DOI: 10.1021/acs.cgd.0c01173
Yijue Xu, Vijith Kumar, Maressa J. Z. Bradshaw and David L. Bryce	
ChB. ACS. 30	

Solution Self-Assembly of Chalcogen-Bonding Polymer Partners	ACS Macro Letters 2020, 9, 8, 1102-1107 (Letter) DOI: 10.1021/acsmacrolett.0c00511
Rongjin Zeng, Zehao Gong, Liang Chen and Qiang Yan	
ChB. ACS. 31	

Enhanced Sulfur Dioxide Adsorption in UiO-66 Through Crystal Engineering and Chalcogen Bonding	Crystal Growth & Design 2020, 20, 9, 6139-6146 (Article) DOI: 10.1021/acs.cgd.0c00846
Ian Walton, Carmen Chen, Jessica M. Rimsza, Tina M. Nenoff and Krista S. Walton	
ChB. ACS. 32	

Lewis Ambiphilicity of 1,2,5-Chalcogenadiazoles for Crystal Engineering: Complexes with Crown Ethers	Crystal Growth & Design 2020, 20, 9, 5868-5879 (Article) DOI: 10.1021/acs.cgd.0c00536
Elena A. Chulanova, Ekaterina A. Radiush, Inna K. Shundrina, Irina Yu. Bagryanskaya, Nikolay A. Semenov, Jens Beckmann, Nina P. Gritsan and Andrey V. Zibarev	
ChB. ACS. 33	

Fluorescent Membrane Tension Probes for Super-Resolution Microscopy: Combining Mechanosensitive Cascade Switching with Dynamic-Covalent Ketone Chemistry	Journal of the American Chemical Society 2020, 142, 28, 12034-12038 (Communication) DOI: 10.1021/jacs.0c04942
José García-Calvo, Jimmy Maillard, Ina Fureraj, Karolina Strakova, Adai Colom, Vincent Mercier, Aurelien Roux, Eric Vauthey, Naomi Sakai, Alexandre Fürstenberg and Stefan Matile	
ChB. ACS. 34	

Chalcogen-Bonding Supramolecular Polymers	The Journal of Organic Chemistry 2020, 85, 13, 8397-8404 (Article) DOI: 10.1021/acs.joc.0c00723
Rongjin Zeng, Zehao Gong and Qiang Yan	
ChB. ACS. 35	

Synthesis and Characterization of SF4 Adducts with Polycyclic Amines	Inorganic Chemistry 2020, 59, 12, 8620-8628 (Article) DOI: 10.1021/acs.inorgchem.0c01105
Nathan Kostiuk, James T. Goettel and Michael Gerken	
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Insights into the weak Csp3–H···H–Csp3 mediated supramolecular architecture in ethyl 2-(5-bromopentanamido)-4,5,6,7-tetrahydrobenzo[b]thiophene-3-carboxylate, a probable selective COX-2 lead molecule: An integrated crystallographic and theoretical approach		Journal of Molecular Structure, 1199(2020)127019 doi.org/10.1016/j.molstruc.2019.127019
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-13
Enantioseparation of fluorinated 3-arylthio-4,4'-bipyridines: Insights into chalcogen and π-hole bonds in high-performance liquid chromatography		Journal of Chromatography A, 1567(2018)119-129 doi.org/10.1016/j.chroma.2018.06.060
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-14
Halogen bonding motifs for anion recognition		Coordination Chemistry Reviews, 416(2020)213281 doi.org/10.1016/j.ccr.2020.213281
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-15
Chalcogen bonding in materials chemistry	Coordination Chemistry Reviews, 422(2020)213464 doi.org/10.1016/j.ccr.2020.213464	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-16
Pnicogen and chalcogen bonds in cyclometalated iridium(III) complexes	InorganicaChimica Acta, 477(2018)31-33 doi.org/10.1016/j.ica.2018.02.029	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-17
Copper-catalyzed Csp-chalcogen bond formation: Versatile approach to N-(3-(organochalcogenyl)prop-2-yn-1-yl)amides	Tetrahedron, 75(2019)4017-4023 doi.org/10.1016/j.tet.2019.06.031	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-18
Supramolecular association in Cu(II) and Co(II) coordination complexes of 3,5-dimethylpyrazole: Experimental and theoretical studies	InorganicaChimica Acta, 484(2019)133-141 doi.org/10.1016/j.ica.2018.09.035	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-19
Anion-reliant structural versatility of novel cadmium(II) complexes: Synthesis, crystal structures, photoluminescence properties and exploration of unusual O···S chalcogen bonding involving thiocyanate coligand	InorganicaChimica Acta, 469(2018)189-196 doi.org/10.1016/j.ica.2017.09.005	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-20
A comparative study of S···π chalcogen bonds between SF2 or SFH and CC multiple bonds	Journal of Molecular Structure, 1188(2019)62-68 doi.org/10.1016/j.molstruc.2019.03.085	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-21
Pnictogen bonding in coordination chemistry		Coordination Chemistry Reviews, 418(2020)213381 doi.org/10.1016/j.ccr.2020.213381
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-22
Thiophene ring-opening reactions. Direct access to the synthesis of 1,3,4-thiadiazoline-(condenced) pyridone hybrids		Tetrahedron, 83(2021)131957 doi.org/10.1016/j.tet.2021.131957
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-23
The 2,2,4,4-tetrafluoro-1,3-dithietane···NH3 complex: A rotational study reveals a N···σ-hole interaction		Journal of Molecular Spectroscopy, 376(2021)111409 doi.org/10.1016/j.jms.2020.111409
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-24
Probing C···S chalcogen bonds in complexes SC:SHX, for X = NO2, NC, F, Cl, CN, CCH, and NH2		Chemical Physics Letters, 721(2019)86-90 doi.org/10.1016/j.cplett.2019.02.016
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-25
Endocrine-disrupting pollutants properties affecting their bioactivity, remediation, and detection		Current Opinion in Green and Sustainable Chemistry, 30(2021)100485 doi.org/10.1016/j.cogsc.2021.100485
Valentina Dichiarante and Gabriella Cavallo and PierangeloMetrangolo		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-26
A chalcogen_bonded complex (CH3)3N···SCO characterised by rotational spectroscopy		Chemical Physics Letters, 743(2020)137177 doi.org/10.1016/j.cplett.2020.137177
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-27
Chalcogen–chalcogen_bond activation by an ambiphilic, doubly reduced organoborane		Tetrahedron, 75(2019)26-30 doi.org/10.1016/j.tet.2018.11.012
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-28
Chalcogen bonding in crystalline diselenides and selenocyanates: From molecules of pharmaceutical interest to conducting materials	Coordination Chemistry Reviews, 403(2020)213084doi.org/10.1016/j.ccr.2019.213084	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-29
Anion recognition based on halogen, chalcogen, pnictogen and tetrel bonding	Coordination Chemistry Reviews, 413(2020)213270 doi.org/10.1016/j.ccr.2020.213270	
Mark S. Taylor		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-30
Ultrafast Force-Clamp Spectroscopy Reveals “Sliding” Catch-Bond Behavior of the Microtubule-Binding NdC80 Protein	Biophysical Journal, 114(2018)382adoi.org/10.1016/j.bpj.2017.11.2114	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-31
Chalcogen_bond driven molecular recognition at work	Coordination Chemistry Reviews, 413(2020)213243 doi.org/10.1016/j.ccr.2020.213243	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-32
Exploring N…C tetrel and O…S chalcogen bonds in HN(CH)SX:OCS systems, for X = F, NC, Cl, CN, CCH, and H	Chemical Physics Letters, 730(2019)466-471 doi.org/10.1016/j.cplett.2019.05.044	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-33
Zero-, one-, two- and three-dimensional supramolecular architectures sustained by Se…O chalcogen bonding: A crystallographic survey	Coordination Chemistry Reviews, 427(2021)213586 doi.org/10.1016/j.ccr.2020.213586	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-34
Structures of clusters surrounding ions stabilized by hydrogen, halogen, chalcogen, and pnicogen bonds		Chemical Physics, 524(2019)55-62 doi.org/10.1016/j.chemphys.2019.05.005
Steve Scheiner and Mariusz Michalczyk and WiktorZierkiewicz		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-35
Aqueous dispersions of thienoisoindigo-based semiconductor nanorods assembled with 2-bromobenzaldehyde and a phospholipid		Journal of Molecular Liquids, 288(2019)111046 doi.org/10.1016/j.molliq.2019.111046
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-36
Structures and energetics of clusters surrounding diatomic anions stabilized by hydrogen, halogen, and other noncovalent bonds		Chemical Physics, 530(2020)110590 doi.org/10.1016/j.chemphys.2019.110590
Steve Scheiner and Mariusz Michalczyk and RafałWysokiński and WiktorZierkiewicz		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-37
Synthesis of Pd(II) complexes of unsymmetrical, hybrid selenoether and telluroether ligands: Isolation of tellura-palladacycles by fine tuning of intramolecular chalcogen bonding in hybrid telluroether ligands		Polyhedron,172(2019)95-103 doi.org/10.1016/j.poly.2019.03.036
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-38
Ferrocenylthiocarboxylates: Synthesis, solid-state structure and electrochemical investigations		Journal of Organometallic Chemistry, 847(2017)59-67 doi.org/10.1016/j.jorganchem.2017.03.053
Deeb Taher and Firas F. Awwadi and J. Matthäus Speck and Marcus Korb and Christoph Wagner and Emad M. Hamed and Mousa Al-Noaimi and Almeqdad Y. Habashneh and Mohammad El-khateeb and Sultan T. Abu-Orabi and Kurt Merzweiler and Heinrich Lang		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-39
Chalcogen bonding interactions between reducible sulfur and selenium compounds and models of zinc finger proteins		Journal of Inorganic Biochemistry, 157(2016)94-103doi.org/10.1016/j.jinorgbio.2016.01.013
Patricia B. Lutz and Craig A. Bayse		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-40
Competition and cooperativity between tetrel bond and chalcogen bond in complexes involving F2CX (X = Se and Te)		Chemical Physics Letters, 620(2015)7-12 doi.org/10.1016/j.cplett.2014.12.015
Xin Guo and Yan-Wen Liu and Qing-Zhong Li and Wen-Zuo Li and Jian-Bo Cheng		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-41
Defect studies by X-ray diffraction, electrical and optical properties of layer type tungsten mixed molybdenum sulphoselenide		Solid State Ionics, 176(2005)513-521doi.org/10.1016/j.ssi.2004.06.020
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-42
A theoretical investigation of the sulfur—selenium bond		Journal of Molecular Structure: THEOCHEM, 91(1983)337-352 doi.org/10.1016/0166-1280(83)80079-7
RistoLaitinen and TapaniPakkanen		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-43
Chalcogen–acetylide interaction and unusual reactivity of coordinated acetylide with water: synthesis and characterisation of [(η5-C5R5)Fe3(CO)6(μ3-E)(μ3-ECCH2RI)] (R=H, Me; RI=Ph, Fc; E=S, Se) and [(η5-C5R5)MoFe2(CO)6(μ3-S)(μ-SCCH2Ph)] (R=H, Me)		Journal of Organometallic Chemistry, 665(2003)226-232 doi.org/10.1016/S0022-328X(02)02123-X
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-44
Isotope effects in the electronic spectra of singly ionised S+ and Se+ donors in silicon		Physica B: Condensed Matter, 340(2003)760-764 doi.org/10.1016/j.physb.2003.09.123
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-45
An ab initio comparison of dichalcogen hydrides		Journal of Molecular Structure: THEOCHEM, 124(1985)293-305 doi.org/10.1016/0166-1280(85)80017-8
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-46
Carbon-chalcogen bond cleavage reactions characterized for dinuclear sulfur-bridged cyclopentadienyl molybdenum complexes		Polyhedron, 16(1997)3089-3098 doi.org/10.1016/S0277-5387(96)00522-0
M. RakowskiDuBois		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-47
Hemi bonds and noncovalent interactions in the cational systems (XH2P: SHY)+		Chemical Physics Letters, 659(2016)126-132 doi.org/10.1016/j.cplett.2016.07.011
Xiang Li and An Yong Li		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-48
Covalency in the f-element–chalcogen bond: Computational studies of [M(N(EPH2)2)3] (M = La, U, Pu; E = O, S, Se, Te)		Journal of Alloys and Compounds, 444-445(2007)369-375 doi.org/10.1016/j.jallcom.2007.03.048
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-49
Competition of chalcogen bond, halogen bond, and hydrogen bond in SCSHOX and SeCSeHOX (X=Cl and Br) complexes		Computational and Theoretical Chemistry, 980(2012)56-61 doi.org/10.1016/j.comptc.2011.11.019
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-50
Facile synthesis of benzimidazolin-2-chalcogenones: Nature of the carbon–chalcogen bond		Journal of Organometallic Chemistry, 717(2012)61-74 doi.org/10.1016/j.jorganchem.2012.07.025
Sudesh T. Manjare and Sagar Sharma and Harkesh B. Singh and Ray J. Butcher		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-51
Regioselective addition of chalcogenol to an η3-propargyl/allenyl complex via formation of the carbon-chalcogen bond leading to new chalcogenoxyallyl species		Journal of Organometallic Chemistry, 520(1996)85-96 doi.org/10.1016/0022-328X(96)06269-9
Fu-Yu Tsai and Ray-Hsi Hsu and Tsang-Miao Huang and Jwu-Ting Chen and Gene-Hsiang Lee and Yu Wang		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-52
Synthesis, crystal structure and DFT studies of a Zinc(II) complex of 1,3-diaminopropane (Dap), [Zn(Dap)(NCS)2][Zn(Dap)(NCS)2]n. The additional stabilizing role of S···π chalcogen bond		Journal of Molecular Structure, 1133(2017)271-277doi.org/10.1016/j.molstruc.2016.11.085
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-53
A theoretical investigation of the sulfur-selenium bond		doi.org/10.1016/0022-2860(82)90188-0Journal of Molecular Structure, 91(1982)337-352
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-54
Supramolecular assembly based on “emerging” intermolecular interactions of particular interest to coordination chemists		Coordination Chemistry Reviews, 345(2017)29-228 doi.org/10.1016/j.ccr.2017.01.009
Edward R.T. Tiekink		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-55
Bifurcated chalcogen bonds: A theoretical study on the structure, strength and bonding properties		Chemical Physics Letters,634(2015)210-215 doi.org/10.1016/j.cplett.2015.06.034
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-56
Ionicity and charge density waves in layered transition-metal dichalcogenides		Physica B+C, 105(1981)410-413 doi.org/10.1016/0378-4363(81)90285-0
K.L. Ngai and Fu-Sui Liu		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-57
An ab initio study on chalcogen–chalcogen bond interactions in cyclic (SHX)3 complexes (X=F, Cl, CN, NC, CCH, OH, OCH3, NH2)		Chemical Physics Letters, 628(2015)71-75 doi.org/10.1016/j.cplett.2015.04.013
Mehdi D. Esrafili and FaribaMohammadian-Sabet		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-58

Tetrel bonds between PySiX3 and some nitrogenated bases: Hybridization, substitution, and cooperativity	Journal of Molecular Graphics and Modelling, 65(2016)35-42 doi.org/10.1016/j.jmgm.2016.02.005
Mingxiu Liu and Qingzhong Li and Wenzuo Li and Jianbo Cheng	

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-59
The bifurcate chalcogen bond: Some theoretical observations	Journal of Molecular Structure: THEOCHEM, 916(2009)135-138 doi.org/10.1016/j.theochem.2009.09.021	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-60
Chapter Five - A Synopsis of the Properties and Applications of Heteroaromatic Rings in Medicinal Chemistry	Advances in Heterocyclic Chemistry, 123(2017)245-361 doi.org/10.1016/bs.aihch.2016.11.002	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-61
Convenient preparation of ytterbium(III) chalcogenolate complexes by insertion of ytterbium into chalcogen_chalcogen bonds. Application in the ring-opening of epoxides	Tetrahedron Letters, 41(2000)4923-4927 doi.org/10.1016/S0040-4039(00)00687-0	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-62
Potassium tert-butoxide-mediated synthesis of unsymmetrical diaryl ethers, sulfides and selenides from aryl bromides	Tetrahedron, 69(2013)5383-5392 doi.org/10.1016/j.tet.2013.04.113	
Amit Kumar and Bhagat Singh Bhakuni and Ch. Durga Prasad and Shailesh Kumar and Sangit Kumar		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-63
Thioformyl chloride dimer: An excellent model system for the assessment of new computational methods	Computational and Theoretical Chemistry, 983(2012)83-87 doi.org/10.1016/j.comptc.2012.01.006	
Yu Zhang and Ning Ma and Weizhou Wang		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-64
An ab initio study on cationic chalcogen bond interactions between F3−nHnS+ (n=0–2) and nitrogen bases		Chemical Physics Letters, 645(2016)32-37 doi.org/10.1016/j.cplett.2015.12.027
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-65
Asymmetries in local bonding sites in amorphous semiconductors: very high field NMR of 75As		Journal of Non-Crystalline Solids, 227-230(1998)770-774 doi.org/10.1016/S0022-3093(98)00181-1
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-66
Tetrahedral covalent radius of Mn in AII1−xMnxBVI and AIII1−xMnxBV compounds – Supplement to the paper: Chem. Phys. Lett. 350 (2001) 577		Chem Phys Let, 359(2002)516-519 doi.org/10.1016/S0009-2614(02)00717-0
R.J. Iwanowski		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-67
Tetrasulfur tetranitride and its selenium analogs: ab initio and DFT calculations		Journal of Molecular Structure: THEOCHEM, 582(2002)85-90 doi.org/10.1016/S0166-1280(01)00769-2
Gyusung Chung and Duckhwan Lee		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-68
Endocrine-disrupting pollutants properties affecting their bioactivity, remediation, and detection		Current Opinion in Green and Sustainable Chemistry, 30(2021)100485 doi.org/10.1016/j.cogsc.2021.100485
Valentina Dichiarante and Gabriella Cavallo and PierangeloMetrangolo		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		Ch-SD-69
Organoboron compounds as versatile reagents in the transition metal-catalyzed C–S, C–Se and C–Te bond formation		Coordination Chemistry Reviews,442(2021)214012 doi.org/10.1016/j.ccr.2021.214012

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-70
Metalloid Chalcogen–pnictogen σ-hole bonding competition in stibanyltelluranes		Journal of Organometallic Chemistry, 954-955(2021)122092 doi.org/10.1016/j.jorganchem.2021.122092
Rosa M. Gomila and Antonio Frontera		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-71
The structural landscape of ferrocenylpolychalcogenides		Journal of Organometallic Chemistry,951(2021)122006 doi.org/10.1016/j.jorganchem.2021.122006
Yury V. Torubaev and Ivan V. Skabitsky and Abhinav Raghuvanshi		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

Rev		**Ch-SD-72**
Te···N secondary-bonding interactions in tellurium crystals: Supramolecular aggregation patterns and a comparison with their lighter congeners		Coordination Chemistry Reviews,457(2022)214397 doi.org/10.1016/j.ccr.2021.214397
Edward R.T. Tiekink		

Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-73
Molecular Recognition by Chalcogen Bond: Selective Charge-Transfer Crystal Formation of Dimethylnaphthalene with Selenadiazolo-tetracyano-naphthoquino- dimethane		European Journal of Organic Chemistry,6(2021)990-997 doi.org/10.1002/ejoc.202001554
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-74
Lewis Acidic Telluronium Cations: Enhanced Chalcogen_Bond Donor Properties and Application to Transfer Hydrogenation Catalysis		Organometallics,40(2021)2371-2374 doi.org/10.1021/acs.organomet.1c00279
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-75
Synthesis of 2-Aryl-(3-Organochalcogenyl)Thieno[2,3-b]Pyridines Promoted by Oxone		Asian Journal of Organic Chemistry,10(2021)1198-1206 doi.org/10.1002/ajoc.202100102

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-76
Chalcogen bonding and liquid crystallinity: Understanding the anomalous behaviour of the 4′-(alkylthio)[1,1′-biphenyl]-4-carbonitriles (nSCB)		Journal of Molecular Liquids,346(2022)117094 doi.org/10.1016/j.molliq.2021.117094
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-79
Chalcogen bonding mediates the formation of supramolecular helices of azapeptides in crystals11Electronic supplementary information (ESI)		Organic & Biomolecular Chemistry,19(2021)6397-6401 doi.org/10.1039/d1ob01053k
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-80
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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Thiophene ring-opening reactions. Direct access to the synthesis of 1,3,4-thiadiazoline-(condenced) pyridone hybrids	Tetrahedron, 83(2021)131957 doi.org/10.1016/j.tet.2021.131957	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond–

		Ch-SD-84
Charge-assisted chalcogen bonding in 2-(4-substituted benzoyl)thiazolo[3,2-a]pyridin-4-ium bromides	Dyes and Pigments,197(2022)109898 doi.org/10.1016/j.dyepig.2021.109898	
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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		Ch-SD-86
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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

		Ch-SD-87

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--

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Chalcogen – 16 Ch- non Cov bond -- Chalcogen – 16 Ch- non Cov bond--