New Journal of Chemistry, January 2015

- Supplementary Information -

New 3,4,5-Trisubstituted Isoxazoles Derivatives with potential biological properties

Carlos Bustos[a,*], Elies Molins[b], Juan-Guillermo Cárcamo[c], Marcelo N. Aguilar[c], Christian Sánchez[a], Ignacio Moreno-Villoslada[a], Hiroyuki Nishide[d], Angela Mesías-Salazar[a], Ximena Zarate[e], Eduardo Schott[f,*]

[a]*Instituto de Ciencias Químicas, Universidad Austral de Chile, Las Encinas 220, Campus Isla Teja, Valdivia, Chile.*

[b]*Institut de Ciència de Materials de Barcelona (ICMAB-CSIC), Campus de la Universitat Autònoma de Barcelona, 08193 Bellaterra, Spain.*

[c]*Instituto de Bioquímica y Microbiología, Universidad Austral de Chile, Campus Isla Teja, Valdivia, Chile.*

[d]*Department of Applied Chemistry, School of Science and Engineering, Waseda University, Tokyo 169-8555, Japan.*

[e]*Direccion de Postgrado e Investigacion, Universidad Autonoma de Chile, Carlos Antunez 1920, Santiago, Chile.*

[f]*Laboratorio de Bionanotecnologia, Universidad Bernardo O'Higgins, General Gana 1702, Santiago, Chile.*

***email: maschotte@gmail.com, Phone/Fax: 56-2-24772243.**

Geometrical Parameters

Figure S1. General diagram of the studied compounds that contain different substituents groups on the aromatic ring. In grey C atoms, in blue N atoms, in red O atom, in blue H atoms.

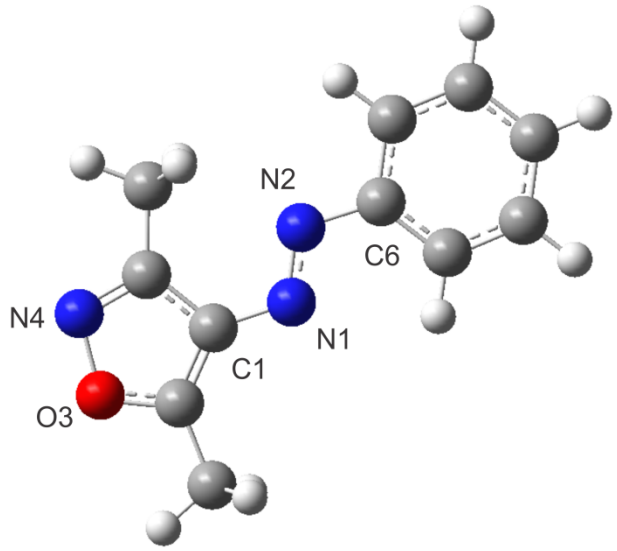


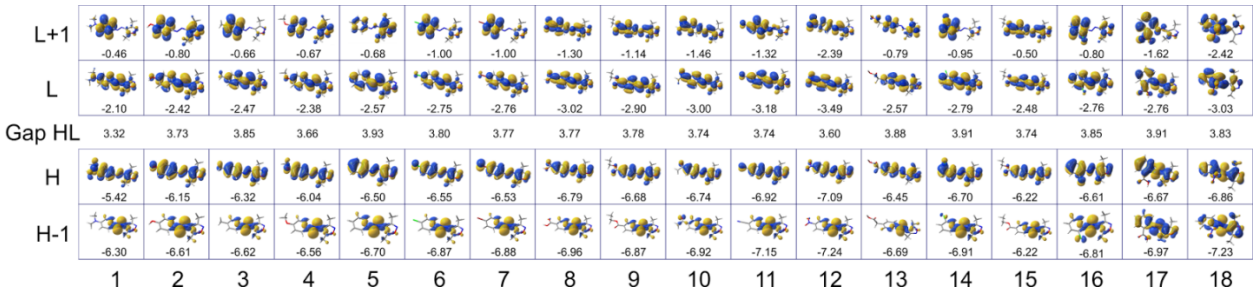
Table S1. Selected bond distances (Å) and angles (º) of the molecular structures of complexes (**1**)-(**18**). The numeration of the atoms is shown in Figure S1. Also the C-R distance corresponds to the distance between the substituted aromatic carbon in the phenyl ring in the corresponding position (*ortho, meta or para*).

	C-R	C6-N2	N2-N1	N1-C1	dihedral	O3-N4
(**1**)	1.47	1.42	1.26	1.39	0	1.42
(**2**)	1.37	1.41	1.27	1.39	0	1.42
(**3**)	1.42	1.42	1.27	1.39	0	1.42
(**4**)	1.36	1.41	1.27	1.39	0	1.42
(**5**)	1.09	1.42	1.26	1.39	0	1.42
(**6**)	1.76	1.42	1.27	1.39	0	1.42
(**7**)	1.90	1.42	1.27	1.39	0	1.42
(**8**)	1.49	1.42	1.27	1.39	0	1.42
(**9**)	1.49	1.42	1.27	1.39	0	1.42
(**10**)	1.50	1.42	1.27	1.39	0	1.42
(**11**)	1.43	1.42	1.27	1.38	0	1.42
(**12**)	1.47	1.42	1.27	1.38	0	1.42
(**13**)	1.52	1.42	1.27	1.39	0	1.42
(**14**)	1.76	1.42	1.26	1.39	0	1.42
(**15**)	1.36	1.41	1.27	1.39	0	1.42
(**16**)	1.75	1.41	1.27	1.39	0	1.42
(**17**)	1.49	1.42	1.26	1.39	160	1.42
(**18**)	1.48	1.41	1.27	1.38	155	1.43

Molecular Orbitals

The occupied frontier molecular orbitals more stables are showed by the compounds 11 and 18 and the less stables are showed by 1 and 4. The gap HL values are between 3.32 and 3.91 eV.

Figure S2. Molecular orbital diagrams for the selected frontier MOs of (**1**)–(**18**) complexes and orbital energies and HOMO-LUMO gap. Values in (eV).



IR

Table S2. Calculated and experimental IR of selected active frequencies (cm^{-1}) for Compounds **1-18**

1								
experimental	n(N=N)	or	n(C=N)	1600s	n(C=C)	1561m	1517m	
theoretical				1619		1545	1540	
2								
experimental	n(N=N)	or	n(C=N)	1617s	n(C=C)	1586s	and	1508m
theoretical				1619		1545		1540
3								
experimental	n(N=N)	or	n(C=N)	1610s	n(C=C)	1589m	and	1497m
theoretical				1654		1615		1541
4								
experimental	n(N=N)	or	n(C=N)	1601s	n(C=C)	1579s	1497s	
theoretical				1624		1546	1509	
5								
experimental	n(N=N)	or	n(C=N)	1611f	n(C=C)	1592m	and	1504w
theoretical				1631		1620		1542
6								
experimental	n(N=N)	or	n(C=N)	1612s	n(C=C)	1590m	1576w	
theoretical				1624		1541	1527	
7								
experimental	n(N=N)	or	n(C=N)	1605s	n(C=C)	1584m	and	1569m
theoretical				1624		1611		
8								
experimental	n(C=C)	1597s	1581m	1505w				
theoretical		1612	1542	1538				
9								
experimental	n(N=N)	or	n(C=N)	1611w	n(C=C)	1598s		
theoretical				1623		1613		
10								

experimental	n(C=C)	1595s	1498w					
theoretical		1623	1503 n=n					
11								
experimental	n(N=N)	or	n(C=N)	1613s	n(C=C)	1597s		
theoretical				1621		1604		
12								
experimental	n(N=N)	or	n(C=N)	1607s	n(C=C)	1583m	1518m	
theoretical				1619		1590	1525	
13								
experimental	1726s	n(N=N)	or	n(C=N)	1612s	n(C=C)	1592w	1504d
theoretical					1636		1624	1542
14								
experimental	n(N=N)	or	n(C=N)	1610s	n(C=C)	1587m	1575m	1504w
theoretical								
15								
experimental	n(N=N)	or	n(C=N)	1619s	n(C=C)	1582s	1511w	
theoretical				1638		1621	1541	
16								
experimental	n(N=N)	or	n(C=N)	1610s	n(C=C)	1586m	1503w	
theoretical				1620		1612	1519	
17								
experimental	n(N=N)	or	n(C=N)	1610m	n(C=C)	1593m	1509w	
theoretical				1622		1615	1527	
18								
experimental	n(N=N)	or	n(C=N)	1606s	n(C=C)	1524s	1474w	
theoretical				1623		1544	1499	

TDDFT

All the electronic transitions that contribute to λmax are from HOMO-1 to LUMO. In the compounds 17 and 18 this peak also show a mainly contribution of the transition HOMO-LUMO and the biggest f than the f values of the other systems.

Table S3. Experimental (exp) and calculated (calc.) wavelength (nm), Energy (eV), Oscillator Strength *f*, Active MOs and their contributions for the vertical excitations from TDDFT for the λmax.

Comp	R	C(mol*L^{-1})	λ(nm) exp.	λ(nm) calc.	E(eV)	*f*	Active MO			Contrib. %
(**1**)	**4-N(CH3)$_2$**	4.09x10^{-5}	392	412	3.01	0.7874	65	->	66	83.0
			328	303	4.09	0.0014	62	->	66	69.1
							65	->	67	24.2
			315	293	4.23	0.1082	63	->	66	83.6
							65	->	68	4.2
(**2**)	**4-OH**	4.72x10^{-5}	346	372	3.33	0.7741	57	->	58	81.2
			246	241	5.13	0.1633	53	->	58	67.4
							57	->	60	23.8
(**3**)	**4-CH$_3$**	6.37x10^{-5}	323	357	3.47	0.7877	57	->	58	81.7
			312h	312	3.98	0.0262	55	->	58	90.8
							57	->	60	5.2
			240	242	5.12	0.0595	53	->	58	77.7
							57	->	59	4.9
							57	->	60	5.4
			234	234	5.29	0.2130	57	->	59	35.2
							57	->	60	47.1
			228h	223	5.56	0.0001	52	->	58	97.5
(**4**)	**4-OCH$_3$**	4.58x10^{-5}	346h	377	3.28	0.7823	61	->	62	81.7
			337	300	4.13	0.0228	58	->	62	4.0
							59	-	6	82.7

		5						> 2	
							61	- > 6 3	7.5
			242	252	4.91	0.0639	57	- > 6 2	2.2
							59	- > 6 2	6.5
							61	- > 6 3	76.1
			317	350	3.55	0.7202	53	- > 5 4	81.6
			308h	313	3.96	0.0334	51	- > 5 4	91.2
							53	- > 5 6	4.5
(**5**)	**4-H**	$5.19x10^{-5}$	233h	241	5.15	0.0448	49	- > 5 4	86.5
							53	- > 5 8	3.3
			228	229	5.42	0.2223	50	- > 5 4	2.8
							53	- > 5 5	24.6
							53	- > 5 6	56.2
			222h	224	5.53	0.0001	48	- > 5 4	97.5
			324	359	3.45	0.8264	61	- > 6 2	82.3
			313h	301	4.12	0.0212	59	- > 6 2	88.3
(**6**)	**4-Cl**	$5.13x10^{-5}$					61	- > 6 3	8.6
			239h	239	5.18	0.0001	60	- > 6 4	98.4
			233	232	5.35	0.1739	61	- > 6 4	85.0
			227	227	5.47	0.0001	55	- > 6 2	92.0
							56	- > 6 2	5.7
			325	363	3.41	0.8634	70	- > 7 1	82.9
			315h	302	4.11	0.0215	68	- > 7 1	87.2
							70	- > 7 2	9.0
			240h	252	4.93	0.0458	65	- > 7 1	90.7
(**7**)	**4-Br**	$5.09x10^{-5}$					67	- > 7 1	2.3
			234	233	5.31	0.1618	63	- > 7 1	3.0
							70	- > 7 3	84.6

			227h	216	5.73	0.0176	63	->	71	64.2
							69	->	74	4.6
							70	->	75	22.4
			322	361	3.43	0.9140	64	->	65	82.1
			233h	215	5.78	0.1099	57	->	65	68.0
(**8**)	**4-CO_2H**	4.79×10^{-5}					62	->	66	7.0
			227	212	5.86	0.0006	56	->	65	85.0
							60	->	66	10.5
			221h	204	6.08	0.0013	64	->	69	90.8
							64	->	70	6.2
			322	362	3.43	0.9451	72	->	73	82.2
			232h	234	5.31	0.0211	66	->	73	24.5
							70	->	74	24.0
							72	->	75	43.1
(**9**)	**4-$CO_2CH_2CH_3$**	4.67×10^{-5}					72	->	76	2.0
			227	229	5.41	0.0000	65	->	73	2.1
							71	->	76	95.0
			220h	223	5.56	0.0634	70	->	74	20.4
							72	->	75	19.8
							72	->	76	50.2
(**10**)	**4-$COCH_3$**	4.77×10^{-5}	330	366	3.39	0.9505	64	->	65	82.1
			229	221	5.61	0.2019	64	->	68	80.5
			321	362	3.43	0.9469	59	->	60	81.9
			234h	237	5.23	0.1132	55	->	60	6.2
							57	->	61	4.5
							59	->	61	38.3
							59	->	62	32.7
(**11**)	**4-CN**	5.00×10^{-5}	227	233	5.31	0.0164	55	->	60	2.7

							56	->	60	2.1
							57	->	61	8.2
							59	->	61	28.3
							59	->	62	45.3
			222	219	5.66	0.0894	57	->	61	9.9
							59	->	63	77.8
(**12**)	**4-NO_2**	$4.75x10^{-5}$	329	348	3.56	0.7965	64	->	66	81.6
			217	224	5.52	0.1471	57	->	66	3.0
							64	->	68	81.9
			322	358	3.47	0.8375	76	->	77	82.0
			311h	311	3.98	0.0290	74	->	77	90.7
							76	->	79	5.1
(**13**)	**4-$CH_2CO_2CH_2CH_3$**	$4.53x10^{-5}$	238h	242	5.13	0.0937	71	->	77	49.8
							76	->	79	27.6
			231	234	5.29	0.0424	71	->	77	24.6
							76	->	78	35.6
			225h	225	5.51	0.0001	69	->	77	96.2
			315	351	3.53	0.7209	61	->	62	81.9
			238h	246	5.04	0.0401	57	->	62	87.2
(**14**)	**3-Cl**	$4.56x10^{-5}$					58	->	62	2.3
			231	238	5.22	0.0546	59	->	65	6.4
							61	->	63	78.7
			226h	227	5.45	0.1748	61	->	64	83.8
			368	384	3.23	0.4733	55	->	58	5.0
							57	->	58	80.1
(**15**)	**2-OH**	$5.06x10^{-5}$	316	335	3.70	0.2571	55	->	58	85.1
							57	->	58	3.0
			247	268	4.63	0.002	54	-	5	81.4

						7		>	8	
							57	->	59	10.7
			214	217	5.70	0.0012	55	->	59	86.8
			319	332	3.74	0.0759	59	->	62	89.9
(**16**)	**2-Cl**	4.71×10^{-5}	241	244	5.0778	0.0356	57	->	62	86.2
			235	239	5.19	0.0661	61	->	63	77.1
			229h	227	5.46	0.0001	55	->	62	98.0
			313	343	3.61	0.5718	63	->	65	51.6
							64	->	65	31.4
(**17**)	**2-CO_2H**	5.04×10^{-5}	233h	247	5.03	0.0755	59	->	65	77.5
							63	->	67	3.5
							64	->	67	7.5
							64	->	68	2.6
			217	218	5.69	0.0016	57	->	65	94.6
							58	->	65	2.2
(**18**)	**2-NO_2**	4.87×10^{-5}	319	320	3.88	0.4078	63	->	66	59.9
							64	->	66	22.4
			221	218	5.68	0.1093	63	->	68	61.5
							64	->	68	19.2