A Computational Study of the Interaction of Trinuclear Regium Complexes of Pyrazolate with Anions

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Pg. S2-19 Table S1. Molecular graph, electronic energy and geometry of the $(Pz-Au)_3:X^{-n}$ complexes

Pg. S20-43 Table S2. Molecular graph, electronic energy and geometry of the $(Pz-Ag)_3:X^{-n}$ complexes

Pg. S44-65 Table S3. Molecular graph, electronic energy and geometry of the $(Pz-Cu)_3:X^{-n}$ complexes

Pg. S66-67 Table S4. Electron density properties at the intermolecular BCPs in the 1:1 complexes.

Pg. S68 Table S5 .Barriers (kJ mol⁻¹) and interhalogen distance (Å) in the maximum of the dissociation curve (Fig. S1) of the 1:2 apical complexes.

Pg. S69 Table S6. Interatomic distances (Å) of the anions in the 1:2 complexes.

Pg. S70 Table S7. Anion-Anion repulsion corrected binding energies (kJ mol⁻¹) in the 1:2 complexes.

Pg. S71-72 Table S8. Electron density properties at the intermolecular BCPs in the 1:2 complexes.

Pg. S73 Table S9. Interatomic distances (Å) of the anions in the 1:3 complexes.

Pg. S74 Table S10. Anion-Anion repulsion corrected binding energies (kJ/mol) in the 1:3 complexes.

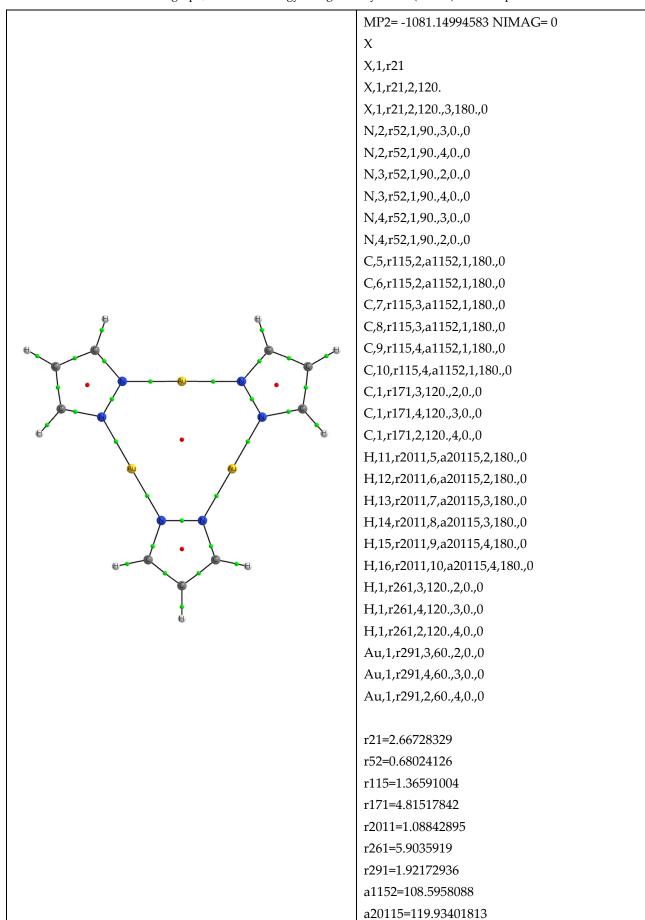
Pg. S75 Table S11. Electron density properties at the intermolecular BCPs in the 1:3 complexes.

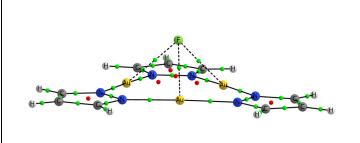
Pg. S76 Table S12. Anion-Metal distances in the CSD search.

Pg. S77. Figure S1. Energy profiles (kJ mol⁻¹) as a function of the X-X distance (Å) in the 1:2 apical complexes. Only one of the X anions in move further away from the (Pz-M)₃ system.

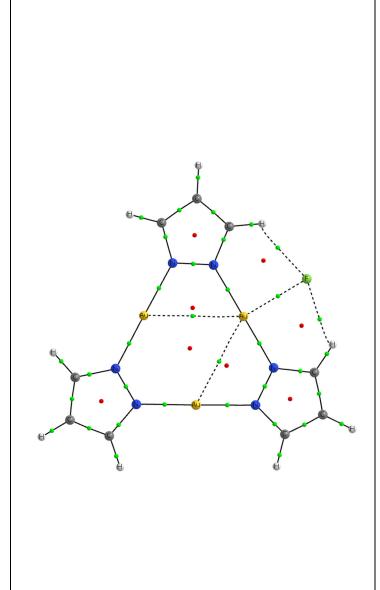
Pg. S78-79 Figure S2. Electron density at the BCP (au) vs. the interatomic distance (Å).

Table S1. Molecular graph, electronic energy and geometry of the (Pz-Au)3:X⁻n complexes.

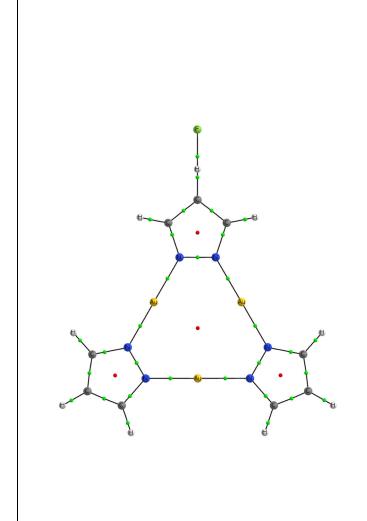




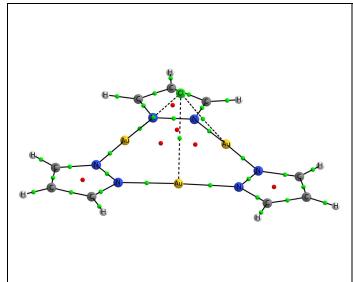
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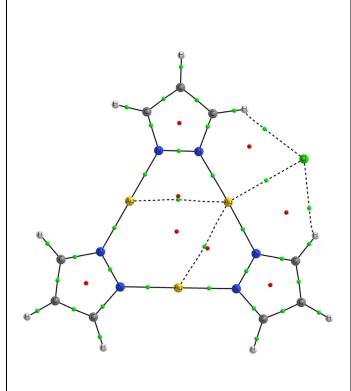


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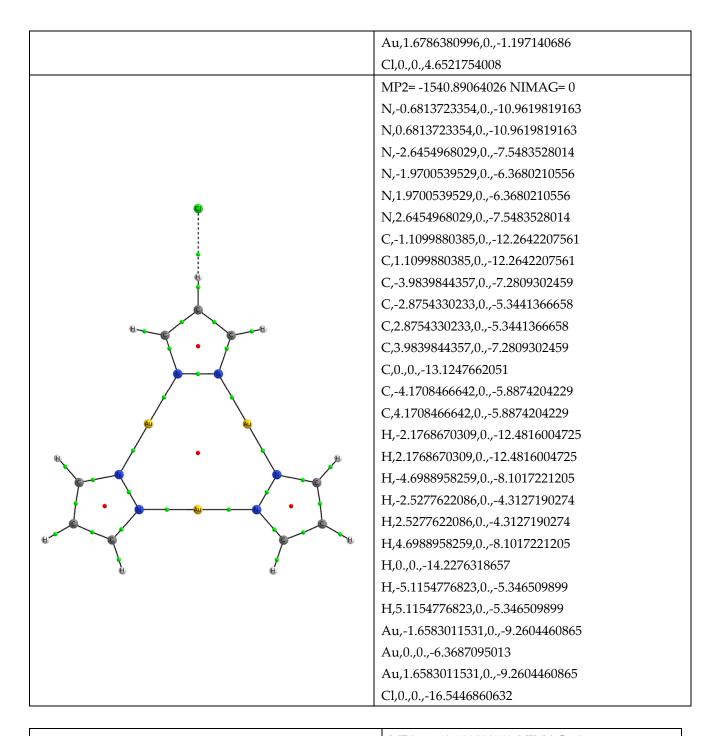


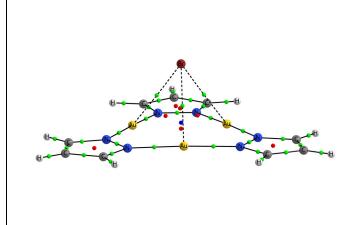
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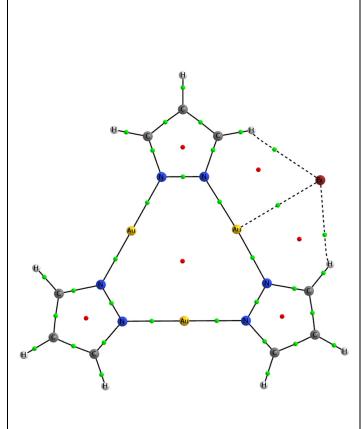
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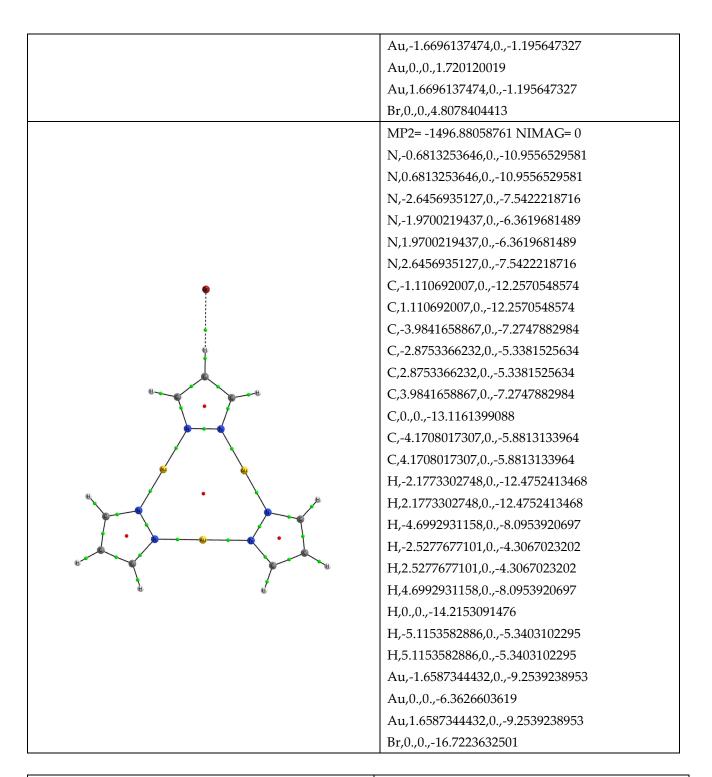


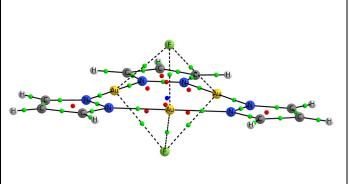
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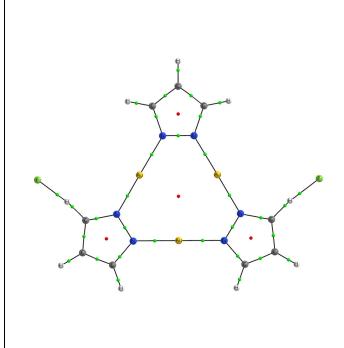
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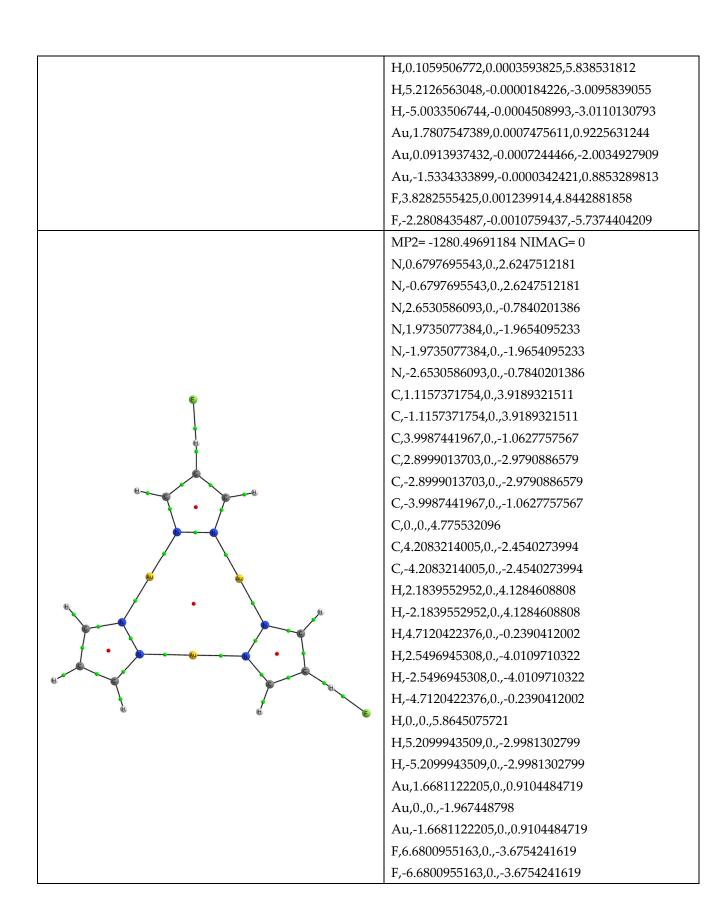


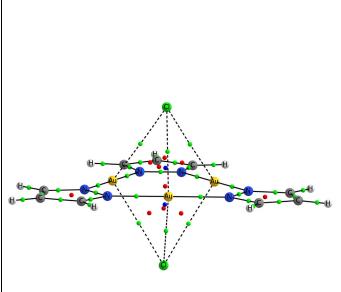
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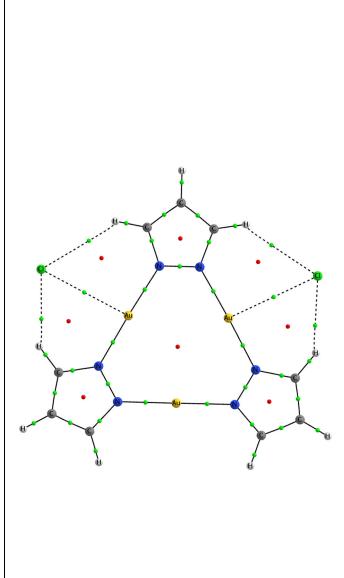


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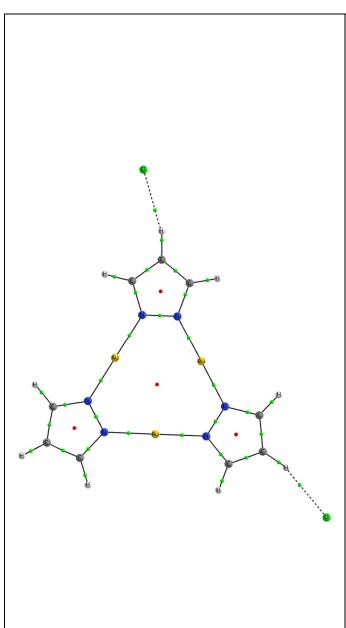




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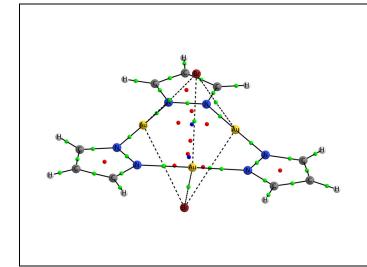


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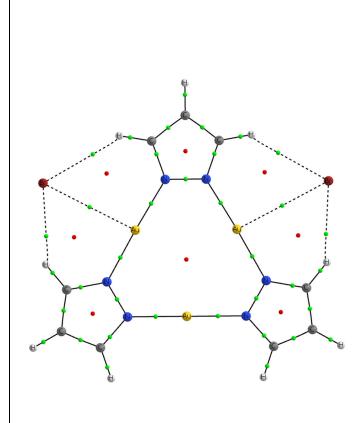
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Cl,-7.591113127,0.,-3.4628519509



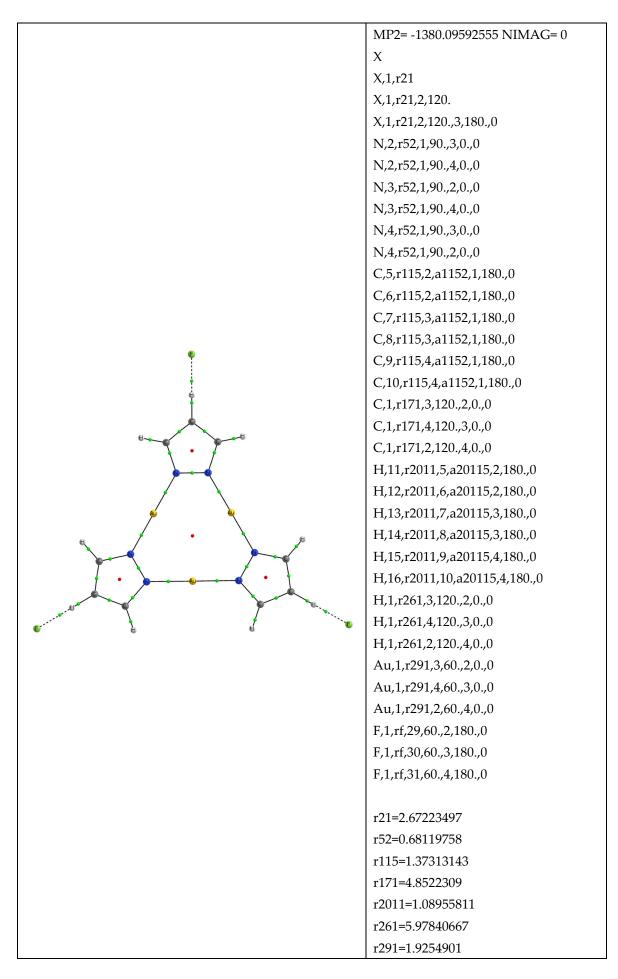
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N,-0.6783394473,-0.0001322153,2.6788112177
N,2.6590856906,-0.0001235768,-0.751954584
N,1.9807566943,-0.000117549,-1.9268792413
N,-1.980761903,-0.0001167982,-1.9268734286
N,-2.6590977213,-0.0001286461,-0.7519508221
C,1.114776051,0.000027442,3.9714324148
C,-1.1147699011,0.0000071632,3.9714289798
C,3.9967463756,0.0000469967,-1.0202858381
C,2.8819972877,0.0000229508,-2.9511350362
C,-2.8819930104,-0.0000251285,-2.9511359636

C,-3.9967560911,0.0000871162,-1.0202855144 C,0.0000029875,0.0000943106,4.8322873768 C,4.1849032482,0.0001152348,-2.4161315852 C,-4.1849013853,0.0001102815,-2.4161341614 H,2.1834471119,0.0000512079,4.1778131506 H,-2.1834406132,0.0000121366,4.1778071788 H,4.7098012946,0.0000735097,-0.1979710099 H,2.5264013141,0.0000275493,-3.9798234914 H,-2.5263922479,-0.0000614881,-3.979822922 H,-4.7098159221,0.0001539003,-0.197973756 H,0.0000029009,0.000204246,5.9223122338 H,5.1288986643,0.0002296685,-2.9611346486 H,-5.1288936438,0.0002233463,-2.9611413547 Au.1.6504818999.-0.0001578454.0.9528997361 Au,-0.0000033128,-0.0001470967,-1.9058459253 Au,-1.6504790816,-0.0001587563,0.952894484 Br,0.0000001176,-2.7416251275,-0.000019256 Br,-0.000000951,2.7414411814,-0.0000022727



MP2= -1912.57058889 NIMAG= 0 N.0.6788265939.0..2.6714444986 N,-0.6826812415,0.,2.6741653113 N,2.6498344328,0.,-0.7433273148 N,1.9686575543,0.,-1.9231602773 N,-1.9741255036,0.,-1.9236033245 N,-2.6572357143,0.,-0.7458633578 C,1.128938146,0.,3.9583618181 C,-1.1124373799,0.,3.9729870007 C,3.989456589,0.,-1.0053628925 C,2.8653980994,0.,-2.9522893071 C,-2.8635728188,0.,-2.9568700228 C,-3.9969263614,0.,-1.0230944693 C,0.0127954484,0.,4.8180176191 C,4.1629379957,0.,-2.4034733724 C,-4.1661279299,0.,-2.420089993 H,2.2089632766,0.,4.1282435834 H,-2.1799410458,0.,4.1888723187 H,4.6857744044,0.,-0.1645603222 H,2.4854006217,0.,-3.9757195095 H,-2.4706821779,0.,-3.9771401053 H,-4.7176403641,0.,-0.206551835 H,0.0198746446,0.,5.9073987589 H,5.1064469711,0.,-2.9482085334 H,-5.1060200732,0.,-2.9709113267

	Au,1.6909096052,0.,0.9775995718
	Au,-0.0011712613,0.,-1.9531704595
	Au,-1.6658560965,0.,0.9617824657
	Br,4.6071927542,0.,2.8308873143
	Br,-0.1480239522,0.,-5.4053896224
	MP2= -1912.57112067 NIMAG= 0
	N,0.6798731457,0.,2.5800906973
	N,-0.6798731457,0.,2.5800906973
	N,2.6542162787,0.,-0.828334765
	N,1.9721604397,0.,-2.0077635252
	N,-1.9721604397,0.,-2.0077635252
	N,-2.6542162787,0.,-0.828334765
\	C,1.1159287103,0.,3.8741531808
	C,-1.1159287103,0.,3.8741531808
, <u>,</u>	C,3.9965665053,0.,-1.100971359
1	C,2.8871191642,0.,-3.0274678956
6	C,-2.8871191642,0.,-3.0274678956
	C,-3.9965665053,0.,-1.100971359
	C,0.,0.,4.7295617914
	C,4.1867672155,0.,-2.491476628
<u></u>	C,-4.1867672155,0.,-2.491476628
•	H,2.1839667005,0.,4.084443362
	H,-2.1839667005,0.,4.084443362
	H,4.7241893787,0.,-0.2914294956
	H,2.5379982211,0.,-4.0587453654
	H,-2.5379982211,0.,-4.0587453654
•	H,-4.7241893787,0.,-0.2914294956
	H,0.,0.,5.8182948907
	H,5.1560172542,0.,-3.0006458446
	H,-5.1560172542,0.,-3.0006458446
	Au,1.6681040204,0.,0.8694980197
	Au,0.,0.,-2.0089299144
	Au,-1.6681040204,0.,0.8694980197
	Br,7.8494902795,0.,-3.1208137654
	Br,-7.8494902795,0.,-3.1208137654



	1
	a1152=107.98694139
	a20115=119.02515627
	rf=7.71367068
	MP2= -2460.24657873 NIMAG= 0
	N,0.6809545795,0.,2.6708887047
	N,-0.6809545795,0.,2.6708887047
	N,2.6535343801,0.,-0.7457160323
	N,1.9725707821,0.,-1.9251550129
	N,-1.9725707821,0.,-1.9251550129
	N,-2.6535343801,0.,-0.7457160323
	C,1.1104970093,0.,3.9718823012
	C,-1.1104970093,0.,3.9718823012
•	C,3.9949963361,0.,-1.0242276463
	C,2.884482493,0.,-2.9476558113
6	C,-2.884482493,0.,-2.9476558113
	C,-3.9949963361,0.,-1.0242276463
6	C,0.,0.,4.8345613364
	C,4.1868381436,0.,-2.4172886348
	C,-4.1868381436,0.,-2.4172886348
<i>y</i>	H,2.1779046615,0.,4.1862413399
. ,	H,-2.1779046615,0.,4.1862413399
	H,4.7143456034,0.,-0.2070098031
1.	H,2.5364101413,0.,-3.9792348591
A. T. A.	H,-2.5364101413,0.,-3.9792348591
	H,-4.7143456034,0.,-0.2070098031
	H,0.,0.,5.931778746
	H,5.1370516344,0.,-2.9659053312
	H,-5.1370516344,0.,-2.9659053312
	Au,1.6666696574,0.,0.9622554284
	Au,0.,0.,-1.9244509373
	Au,-1.6666696574,0.,0.9622554284
	Cl,7.4330396688,0.,-4.2915000533
	Cl,-7.4330396688,0.,-4.2915000533
	Cl,0.,0.,8.5829626372

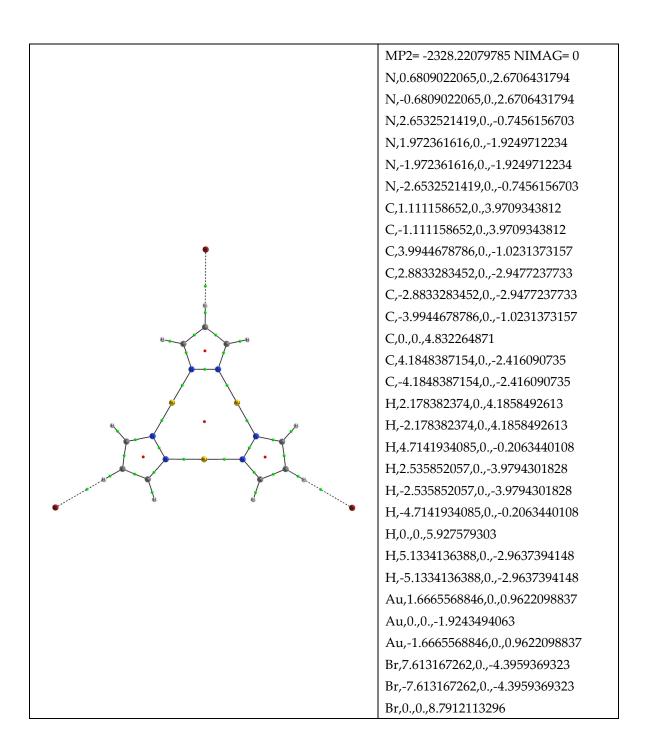
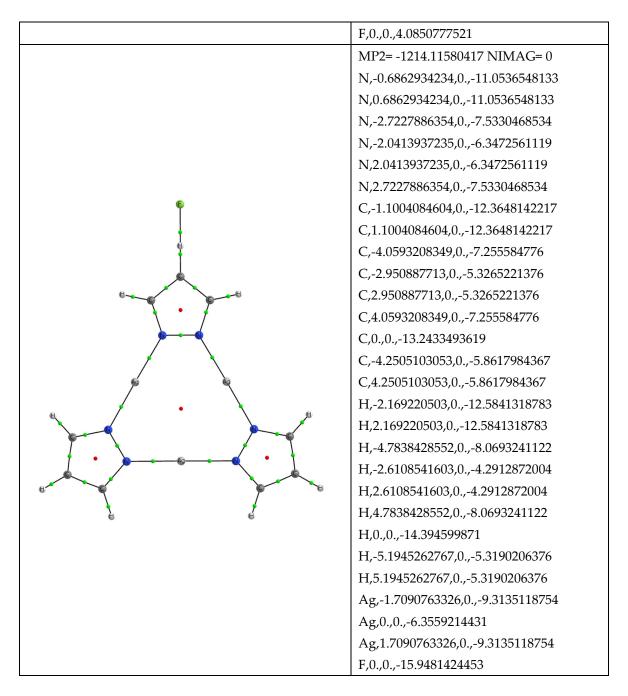


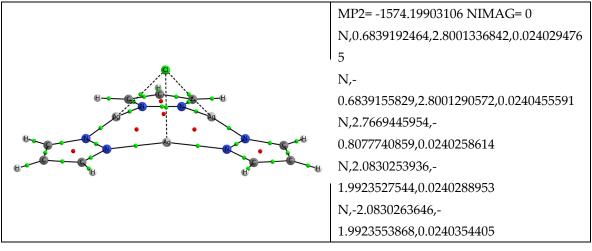
Table S2. Molecular graph, electronic energy and geometry of the (Pz-Ag)₃:X⁻n complexes.

MP2= -1114.42179833 NIMAG= 0 Χ X,1,r21 X,1,r21,2,120. X,1,r21,2,120.,3,180.,0 N,2,r52,1,90.,3,0.,0 N,2,r52,1,90.,4,0.,0 N,3,r52,1,90.,2,0.,0 N,3,r52,1,90.,4,0.,0 N,4,r52,1,90.,3,0.,0 N,4,r52,1,90.,2,0.,0 C,5,r115,2,a1152,1,180.,0 C,6,r115,2,a1152,1,180.,0 C,7,r115,3,a1152,1,180.,0 C,8,r115,3,a1152,1,180.,0 C,9,r115,4,a1152,1,180.,0 C,10,r115,4,a1152,1,180.,0 C,1,r171,3,120.,2,0.,0 C,1,r171,4,120.,3,0.,0 C,1,r171,2,120.,4,0.,0 H,11,r2011,5,a20115,2,180.,0 H,12,r2011,6,a20115,2,180.,0 H,13,r2011,7,a20115,3,180.,0 H,14,r2011,8,a20115,3,180.,0 H,15,r2011,9,a20115,4,180.,0 H,16,r2011,10,a20115,4,180.,0 H,1,r261,3,120.,2,0.,0 H,1,r261,4,120.,3,0.,0 H,1,r261,2,120.,4,0.,0 Ag,1,r291,3,60.,2,0.,0 Ag,1,r291,4,60.,3,0.,0 Ag,1,r291,2,60.,4,0.,0 r21=2.7498381 r52=0.68417589 r115=1.36645246 r171=4.90601527 r2011=1.08948985 r261=5.99465491 r291=1.97902891 a1152=108.26155634 a20115=120.12601866

MP2= -1214.16221409 NIMAG= 0 N,0.6845284454,2.8042020019,0.04217044 N,-0.684526555,2.8042021985,0.0421715786 N,2.7707743953,-0.8092817168, 0.0421704776 N,2.0862473603,-1.994918628,0.0421709719 N,-2.0862471865,-1.9949205114,0.0421687052 N,-2.7707745391,-0.8092833154,0.0421703206 C,1.1110672261,4.0981657838,0.137400929 C,-1.1110666698,4.0981647808,0.137418986 C,4.1046491968,-1.0868701725,0.1374066072 C,2.9935817886,-3.0112944084,0.1374181977 C,-2.9935828094,-3.011295924,0.1374074125 C,-4.1046495614,-1.086870289,0.1374051493 C,0.0000001169,4.9617570267,0.197524789 C,4.2970081392,-2.4808783707,0.1975225257 C,-4.2970086809,-2.4808786975,0.1975172272 H,2.1784734139,4.3185487358,0.15616053 31 Н,-2.1784728878,4.3185464551,0.156196709 H,4.8292091753,-0.2726606238, 0.156170899H,2.6507349467,-4.0458862111,0.1561942778 H,-2.6507367519,-4.045888069, 0.1561776038

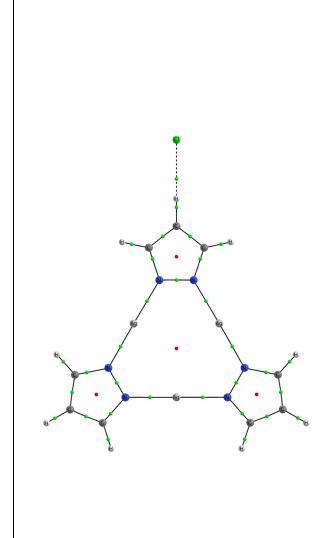
H,-4.8292089073,-0.2726601621,0.1561734535 H,-0.00000013,6.0491520773,0.2722216543 H,5.2387199518,-3.0245760572,0.272217255 H,-5.2387207482,-3.0245759886,0.2722112075 Ag,1.6702750741,0.9643341767,-0.1147617396 Ag, 0.0000003317, -1.928665709, -0.1147559912 Ag,-1.6702723759,0.9643322821,-0.1147530868 F,-0.0000017587,-0.000000671,-1.5068433766 MP2= -1214.14614086 NIMAG= 0 N,-0.6834987362,0.,-2.9761170683 N,0.6834987362,0.,-2.9761170683 N,-2.821161438,0.,0.5078527881 N,-2.0678216748,0.,1.6492588191 N,2.0678216748,0.,1.6492588191 N,2.821161438,0.,0.5078527881 C,-1.1115199447,0.,-4.2736926823 C,1.1115199447,0.,-4.2736926823 C,-4.1441178715,0.,0.8617716116 C,-2.9060491826,0.,2.7228451794 C,2.9060491826,0.,2.7228451794 C,4.1441178715,0.,0.8617716116 C,0.,0.,-5.135767117 C,-4.2407397777,0.,2.2665202801 C,4.2407397777,0.,2.2665202801 H,-2.178578322,0.,-4.4944663742 H,2.178578322,0.,-4.4944663742 H,-4.9188089716,0.,0.0942224103 H,-2.4553216712,0.,3.7178573913 H,2.4553216712,0.,3.7178573913 H,4.9188089716,0.,0.0942224103 H,0.,0.,-6.2249525323 H,-5.1509032781,0.,2.8659655643 H,5.1509032781,0.,2.8659655643 Ag,-1.7507342177,0.,-1.2233459218 Ag,0.,0.,1.829050381 Ag,1.7507342177,0.,-1.2233459218



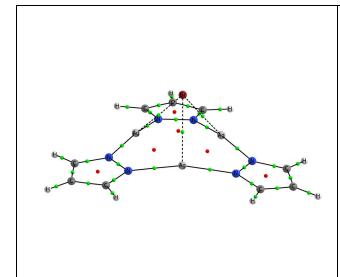


N,-2.7669430716,-0.8077767967,0.0240417649 C,1.1114686414,4.0885396839,0.173552390 C,-1.1114679643, 4.088544489, 0.1734789895C,4.0965181585,-1.0817127979,0.173482467 C,2.9850439317,-3.0068290795,0.1735142785 C,-2.9850443511,-3.0068303836,0.1735323119 C,-4.0965174147,-1.0817135881,0.1734950531 C,-0.0000008222,4.9483007653,0.2695626533 C,4.2853527451,-2.4741510912,0.2695501305 C,-4.2853540377,-2.4741520727,0.2695570768 H,2.1788241702,4.3085496242,0.199686012 6 Н,-2.1788240978,4.308559391,0.1995435204 H,4.8207354565,-0.2673638349,0.1995632093 H,2.6418994988,-4.0411913281,0.1996256249 H,-2.6418998475,-4.0411923126,0.1996488928 H,-4.8207336259,-0.267363669,0.199576549 Н,-0.0000020685, 6.0318760785, 0.3868884585H,5.223755621,-3.0159401418,0.3868761316 H,-5.2237577836,-3.0159405623, 0.3868794658Ag,1.6550622361,0.9555522823,-0.1978392707 Ag,-0.0000010233,-1.9110913519,-0.1978272832

	T
	Ag,-1.6550545057,0.9555442535,-
	0.1978173302
	Cl,-0.0000071331,0.0000019217,-
	2.1860826093
	MP2= -1574.18904016 NIMAG= 0
	N,-0.6833251219,0.,-2.9692456622
	N,0.6833251219,0.,-2.9692456622
	N,-2.7638998472,0.,0.5359922855
	N,-2.0872335055,0.,1.7258839995
	N,2.0872335055,0.,1.7258839995
	N,2.7638998472,0.,0.5359922855
	C,-1.112178376,0.,-4.2662456945
•	C,1.112178376,0.,-4.2662456945
	C,-4.1088191725,0.,0.7959001435
e e	C,-3.0050224915,0.,2.7344188175
	C,3.0050224915,0.,2.7344188175
	C,4.1088191725,0.,0.7959001435
	C,0.,0.,-5.1275182469
1	C,-4.3044372289,0.,2.1885259553
	C,4.3044372289,0.,2.1885259553
	H,-2.1791341243,0.,-4.4873262999
	H,2.1791341243,0.,-4.4873262999
	H,-4.8267648508,0.,-0.0250595036
By B	H,-2.6444070248,0.,3.7643505735
\frac{1}{2}	H,2.6444070248,0.,3.7643505735
	H,4.8267648508,0.,-0.0250595036
	H,0.,0.,-6.2166286351
	H,-5.2528205387,0.,2.7250549727
	H,5.2528205387,0.,2.7250549727
	Ag,-1.7113395525,0.,-1.1978890657
	Ag,0.,0.,2.0318295468
	Ag,1.7113395525,0.,-1.1978890657
	Cl,0.,0.,4.6543487698

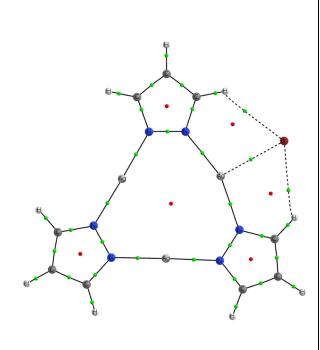


MP2= -1574.15919944 NIMAG= 0 N,-0.6856840736,0.,-11.0328638744 N,0.6856840736,0.,-11.0328638744 N,-2.7225595204,0.,-7.5087480286 N,-2.0408672471,0.,-6.3229482327 N,2.0408672471,0.,-6.3229482327 N,2.7225595204,0.,-7.5087480286 C,-1.1064446174,0.,-12.3381959093 C,1.1064446174,0.,-12.3381959093 C,-4.0594712743,0.,-7.2318026651 C,-2.9508274138,0.,-5.302840778 C,2.9508274138,0.,-5.302840778 C,4.0594712743,0.,-7.2318026651 C.0..0..-13.2039544404 C,-4.2502519215,0.,-5.8383534486 C,4.2502519215,0.,-5.8383534486 H,-2.1724918723,0.,-12.5653311538 H,2.1724918723,0.,-12.5653311538 H,-4.7841969491,0.,-8.0453467611 H,-2.6113232884,0.,-4.2674717821 H,2.6113232884,0.,-4.2674717821 H,4.7841969491,0.,-8.0453467611 H,0.,0.,-14.3051284283 H,-5.1942445204,0.,-5.2956972788 H,5.1942445204,0.,-5.2956972788 Ag,-1.7113574517,0.,-9.2879941689 Ag,0.,0.,-6.3260491668 Ag,1.7113574517,0.,-9.2879941689 Cl.0..0..-16.6715963889



MP2=-1530.19018428 NIMAG= 0
N,0.6838514134,-0.0746029469,2.7998313808
N,-0.6838538219,-0.0746031547,2.799832474
N,2.7666522175,-0.0746016052,-0.8076827988
N,2.0827996199,-0.0745973849,-1.9921502441
N,-2.0827993148,-0.0745970385,-1.9921487977
N,-2.7666528484,-0.0746007975,-0.8076817176
C,1.1115985496,0.0917318681,4.0861026149
C,-1.1115983037,0.0917276911,4.0861050942
C,4.0944672405,0.0917501615,-1.0803781579
C,2.9828729653,0.0917201855,-3.0057256805
C,-2.9828712746,0.0917271656,-3.0057244436
C,-4.094468064,0.0917466948,-1.0803786672

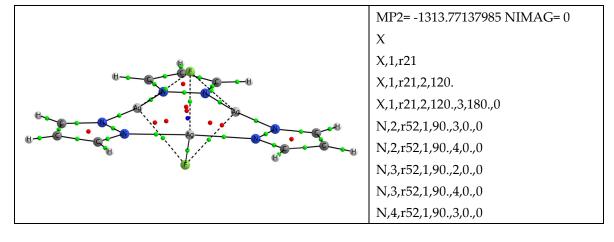
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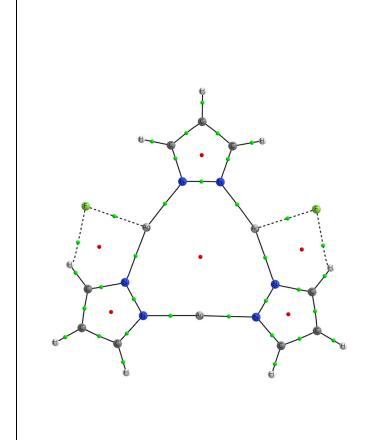
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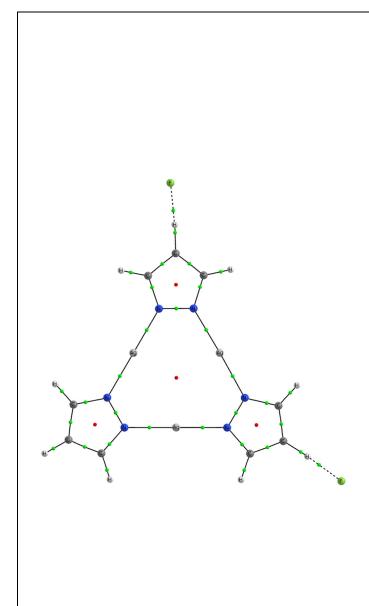
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	N,0.6856232851,0.,-11.0269202899
	N,-2.7225435465,0.,-7.5023755717
	N,-2.0408323992,0.,-6.3165210514
	N,2.0408323992,0.,-6.3165210514
	N,2.7225435465,0.,-7.5023755717
•	C,-1.1071291941,0.,-12.3314858688
	C,1.1071291941,0.,-12.3314858688
	C,-4.0595196231,0.,-7.2255166244
€	C,-2.9508719393,0.,-5.2965539889
	C,2.9508719393,0.,-5.2965539889
H-W	C,4.0595196231,0.,-7.2255166244
	C,0.,0.,-13.1958470574
	C,-4.2502648684,0.,-5.8321289678
	C,4.2502648684,0.,-5.8321289678
	H,-2.1729415999,0.,-12.5592955383
	H,2.1729415999,0.,-12.5592955383
	H,-4.7843038795,0.,-8.0390117519
	H,-2.6114527296,0.,-4.2611650215
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	H,0.,0.,-14.2938450907
	H,-5.1942538977,0.,-5.2894915585
	H,5.1942538977,0.,-5.2894915585
	Ag,-1.71166461,0.,-9.2813016475
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	Ag,1.71166461,0.,-9.2813016475
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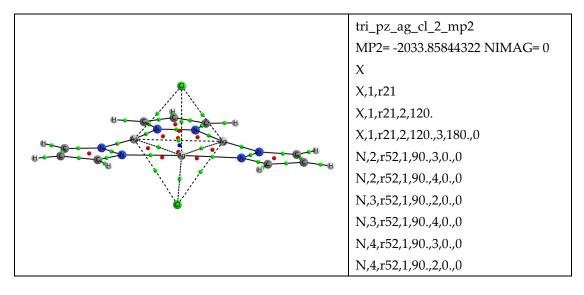
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C,6,r115,2,a1152,1,180.,0
C,7,r115,3,a1152,1,180.,0
C,8,r115,3,a1152,1,180.,0
C,9,r115,4,a1152,1,180.,0
C,10,r115,4,a1152,1,180.,0
C,1,r171,3,120.,2,0.,0
C,1,r171,4,120.,3,0.,0
C,1,r171,2,120.,4,0.,0
H,11,r2011,5,a20115,2,180.,0
H,12,r2011,6,a20115,2,180.,0
H,13,r2011,7,a20115,3,180.,0
H,14,r2011,8,a20115,3,180.,0
H,15,r2011,9,a20115,4,180.,0
H,16,r2011,10,a20115,4,180.,0
H,1,r261,3,120.,2,0.,0
H,1,r261,4,120.,3,0.,0
H,1,r261,2,120.,4,0.,0
Ag,1,r291,3,60.,2,0.,0
Ag,1,r291,4,60.,3,0.,0
Ag,1,r291,2,60.,4,0.,0
F,1,rcl,2,90.,3,90.,0
F,1,rcl,2,90.,3,-90.,0
r21=2.87160594
r52=0.68467026
r115=1.36549193
r171=5.04193545
r2011=1.09128504
r261=6.13395387
r291=1.85382051
a1152=108.16910165
a20115=119.80782174
rcl=1.58245635



MP2= -1313.78379123 NIMAG= 0 N,0.6340192821,0.,2.7693317219 N,-0.7337615116,0.,2.7813064002 N,2.7849830503,0.,-0.816363517 N,2.0994830696,0.,-2.0036843122 N,-2.0813019816,0.,-1.9337426657 N,-2.7755627541,0.,-0.7551970908 C,1.0799539837,0.,4.0569536436 C,-1.155372962,0.,4.0851811306 C,4.123013411,0.,-1.0936246373 C,3.0086134236,0.,-3.0238220354 C,-2.9734479254,0.,-2.9637444066 C,-4.1155571191,0.,-1.0420082294 C,-0.0285365756,0.,4.9322596728 C,4.3150572906,0.,-2.4912994883 C,-4.2857304625,0.,-2.4414164371 H,2.1655580465,0.,4.1976493486 H,-2.2219152569,0.,4.3163401187 H,4.8325014489,0.,-0.2642845155 H,2.6451278287,0.,-4.0529267608 H,-2.5524919488,0.,-3.974252956 H,-4.8490178227,0.,-0.2339350018 H,-0.0210822566,0.,6.0232208091 H,5.2600272911,0.,-3.0368781725 H,-5.2268033616,0.,-2.9933526347 Ag,1.9808205748,0.,1.1228144764 Ag,0.0180244271,0.,-2.2768481764 Ag,-1.7284735485,0.,0.9979346685 F,3.7186453294,0.,2.6696607397 F,-0.4526713554,0.,-4.5552716928



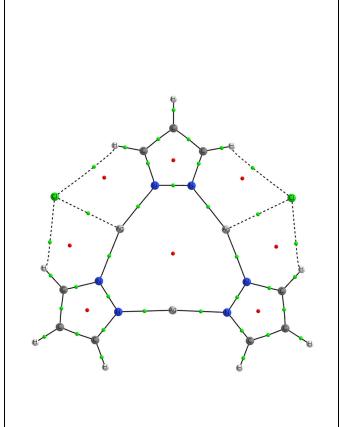
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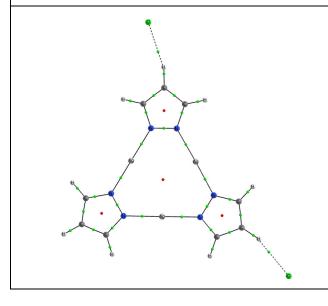
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rcl=2.16522942

32

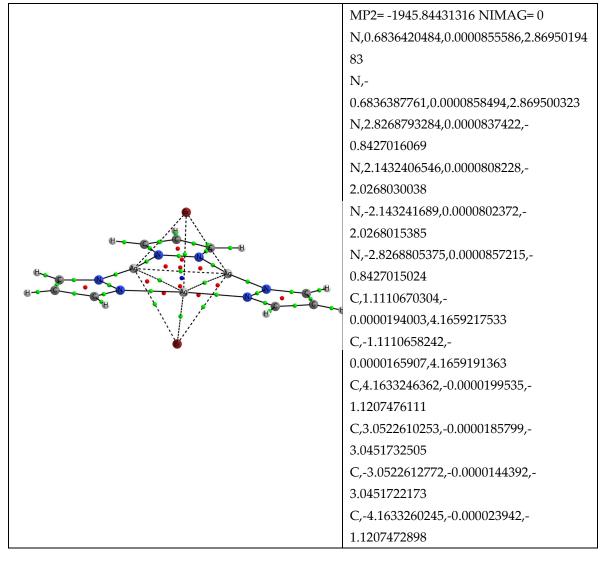


MP2= -2033.87713681 NIMAG= 0 N,0.6692784101,0.,2.8148164179 N,-0.6975983867,0.,2.7583331078 N,2.7525543877,0.,-0.7973134508 N,2.0667708971,0.,-1.9851252996 N,-2.1030633199,0.,-1.9870203143 N,-2.7375857368,0.,-0.7750286294 C,1.0424933976,0.,4.1261904613 C,-1.1870329475,0.,4.0374879226 C,4.0914462872,0.,-1.0735738859 C,2.9754654016,0.,-3.00650948 C,-3.0521390615,0.,-2.9659209963 C,-4.0900835822,0.,-0.9907432736 C,-0.1080451725,0.,4.9423995865 C,4.2793302699,0.,-2.4706724833 C,-4.3342661838,0.,-2.3776299291 H,2.1089799019,0.,4.3584665011 H,-2.2640682671,0.,4.2113899085 H,4.7986706896,0.,-0.2421162576 H,2.6090141746,0.,-4.0347125927 H,-2.7200527605,0.,-4.0056634216 H,-4.7792047796,0.,-0.1449543191 H,-0.1542858387,0.,6.0318495023 H,5.2240225345,0.,-3.0160908165 H,-5.3008778201,0.,-2.8823092954 Ag,1.980615552,0.,1.1509989694 Ag,-0.0064865712,0.,-2.2907628679 Ag,-1.6527433727,0.,0.9542118311 Cl,4.2480339112,0.,2.6778167723 Cl,-0.1950403959,0.,-5.0178136694



MP2= -2033.85619152 NIMAG= 0 N,0.6836020158,0.,2.6864675021 N,-0.6836020158,0.,2.6864675021 N,2.7130971773,0.,-0.8454242555 N,2.0379369488,0.,-2.0384224112 N,-2.0379369488,0.,-2.0384224112 N,-2.7130971773,0.,-0.8454242555 C,1.112651153,0.,3.9831782774 C,-1.112651153,0.,3.9831782774 C,4.0569240634,0.,-1.1156322219 C,2.9696968284,0.,-3.0444022067 C,-4.0569240634,0.,-1.1156322219

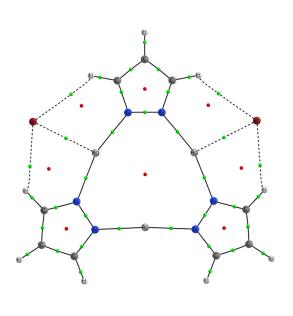
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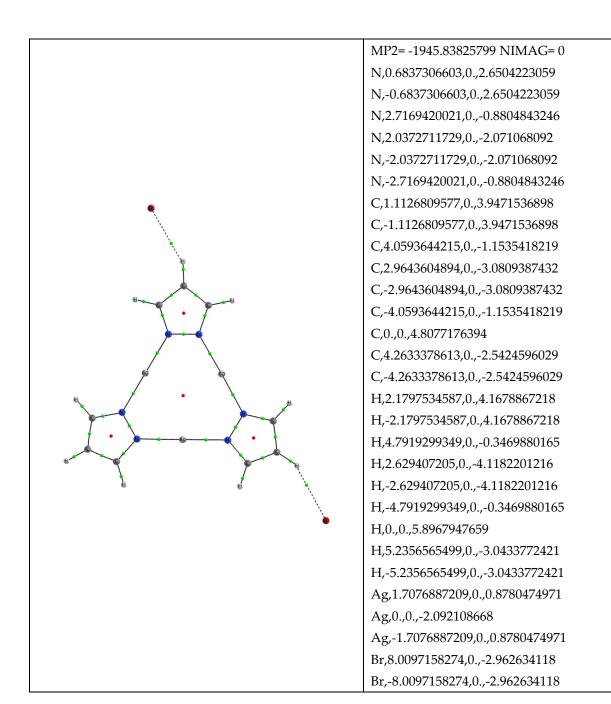
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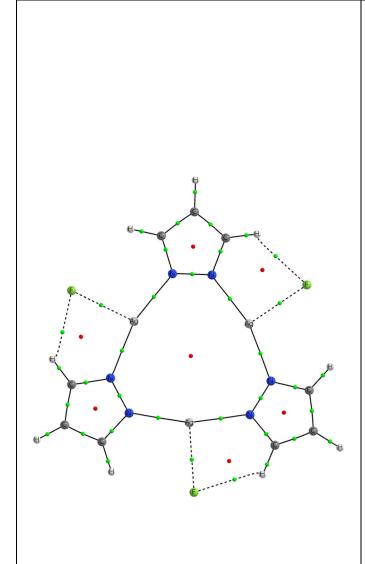
0.0000002371, 2.3137928249, 0.0000017969

35

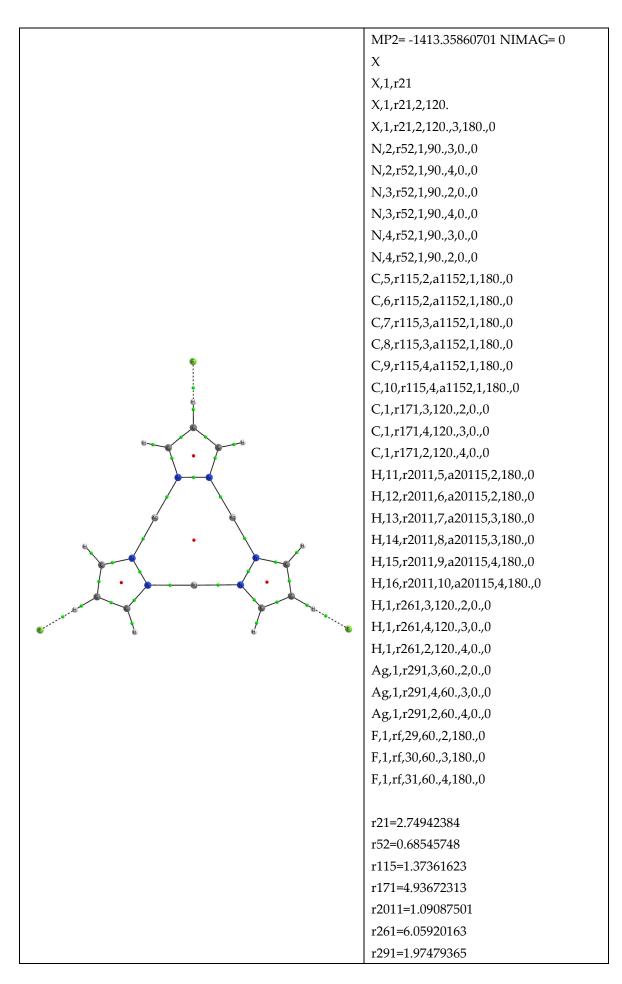


MP2= -1945.85929588 NIMAG= 0 N,0.6770060969,0.,2.8261660211 N,-0.6890223722,0.,2.7509393189 N,2.7500529682,0.,-0.7954035307 N,2.0638661479,0.,-1.9839139669 N,-2.1090285212,0.,-1.999387489 N, -2.7268945206, 0., -0.7787587814C,1.0301882945,0.,4.1433774874 C,-1.1969830942,0.,4.0226829313 C,4.0891032452,0.,-1.0728660453 C,2.9736808727,0.,-3.0048342664 C,-3.0731760144,0.,-2.9638579774 C,-4.082237157,0.,-0.9747236982 C,-0.1315191742,0.,4.9428907954 C,4.2768110622,0.,-2.469218018 C,-4.3464285841,0.,-2.3575464518 H,2.0913615726,0.,4.3966365256 H,-2.2764225464,0.,4.1807053333 H,4.7985993818,0.,-0.243754698 H,2.6103974517,0.,-4.0338316182 H,-2.7619181361,0.,-4.0094905132 H,-4.7588082976,0.,-0.1189129118 H,-0.1926751989,0.,6.0314838369 H,5.2213702236,0.,-3.0145595041 H,-5.3197558247,0.,-2.8488803016 Ag,1.9929156,0.,1.1618628371 Ag,-0.0097449327,0.,-2.3068469558 Ag,-1.6338418257,0.,0.9432990179 Br,4.3727292982,0.,2.7272745535 Br,-0.1755243973,0.,-5.1505319329

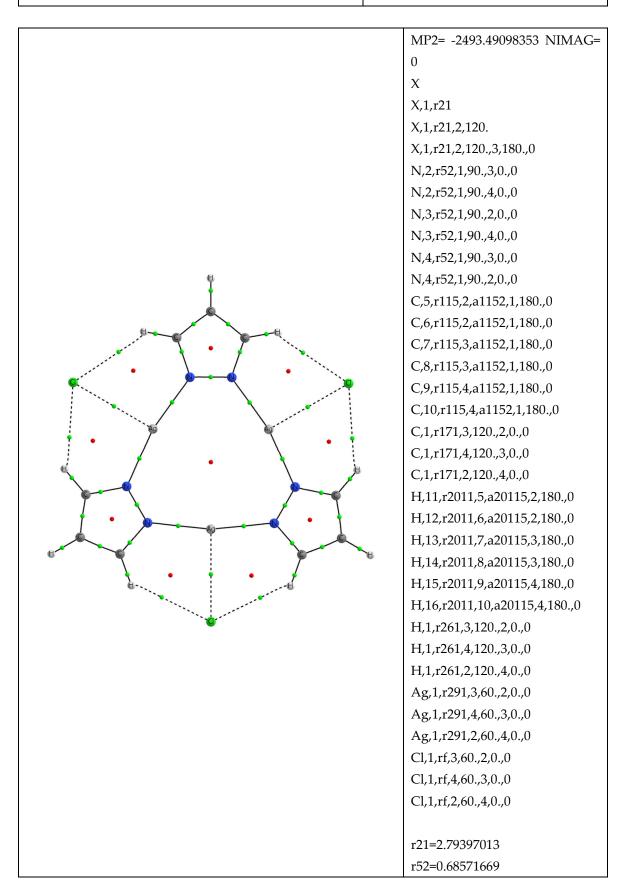


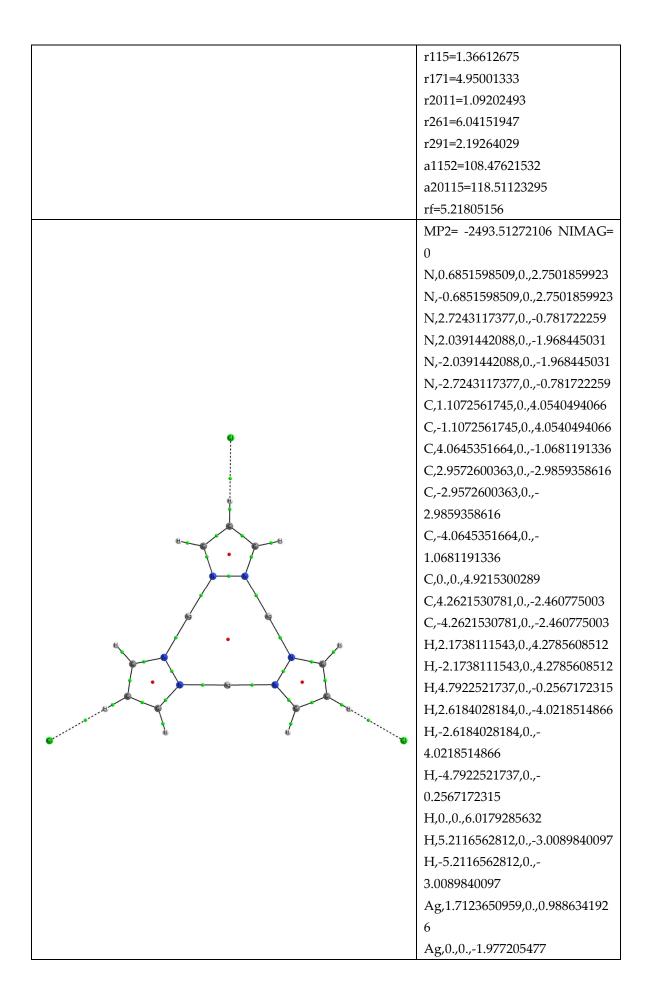


MP2= -1413.33410188 NIMAG= 0 N,2.0770234505,2.0065051895,0. N,2.7877750217,0.8339166705,0. N,-2.1161906449,1.9970951658,0. N,-2.7766291359,0.7955427971,0. N,-0.6717914492,-2.8312640559,0. N,0.6990362856,-2.802046163,0. C,2.9567938161,3.0509702582,0. C,4.1193772809,1.1409895713,0. C,-3.0475670163,2.997120365,0. C,-4.1210150428,1.035593887,0. C,-1.0716693873,-4.1380015281,0. C,1.1637496209,-4.0861920796,0. C,4.2774018335,2.5458760107,0. C,-4.3434058262,2.4318904064,0. C,0.0659988538,-4.9772860986,0. H,2.5400814212,4.0618687343,0. H,4.8424027577,0.3223866829,0. H,-2.6997122779,4.0324017526,0. H,-4.7881785659,0.1693542652,0. H,-2.1420618506,-4.3550362123,0. H,2.2475968949,-4.2304810244,0. H,5.2114791522,3.1129020416,0. H,-5.301392823,2.9576608309,0. H,0.0897529614,-6.0697788229,0. Ag,-0.0230337063,2.3036672882,0. Ag,-1.9844364922,-1.172171348,0. Ag, 2.0068671051, -1.1321019238, 0. F,0.1654123113,4.7070373474,0. F,-4.1612152342,-2.2089746233,0. F,3.9925506858,-2.4994433848,0.

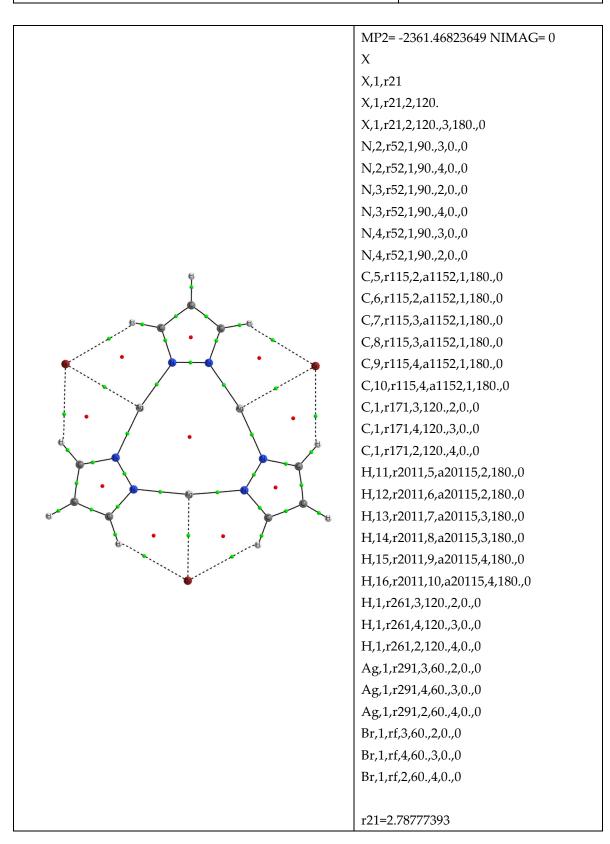


a1152=107.65730918 a20115=119.23117844 rf=7.83637357





Ag,-
1.7123650959,0.,0.9886341926
Cl,7.584478187,0.,-4.3789157976 Cl,-7.584478187,0.,-4.3789157976
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Cl,0.,0.,8.7578186132



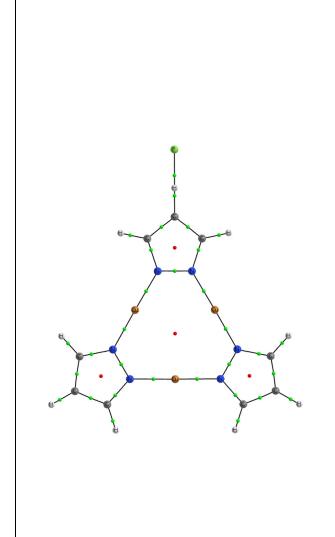
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	r52=0.68572162
	r115=1.36626381
	r171=4.94273653
	r2011=1.09169169
	r261=6.03388486
	r291=2.16154697
	a1152=108.47041342
	a20115=118.71279244
	rf=5.3999374
	MP2= -2361.48741177 NIMAG= 0
	N,0.6850495639,0.,2.7503041832
	N,-0.6850495639,0.,2.7503041832
	N,2.7243518812,0.,-0.7818772151
	N,2.0393017978,0.,-1.9684153026
	N,-2.0393017978,0.,-1.9684153026
	N,-2.7243518812,0.,-0.7818772151
	C,1.1079138977,0.,4.0534702125
	C,-1.1079138977,0.,4.0534702125
•	C,4.0643589206,0.,-1.0672503843
	C,2.9564411232,0.,-2.9862122949
	C,-2.9564411232,0.,-2.9862122949
†	C,-4.0643589206,0.,-1.0672503843
6	C,0.,0.,4.9196369031
	C,4.26052172,0.,-2.459816028
	C,-4.26052172,0.,-2.459816028
69	H,2.1742791756,0.,4.2784256277
	H,-2.1742791756,0.,4.2784256277
	H,4.7923598312,0.,-0.2562296466
1.	H,2.6180733793,0.,-4.0221887626
	H,-2.6180733793,0.,-4.0221887626
	H,-4.7923598312,0.,-0.2562296466
	H,0.,0.,6.0143474095
	H,5.2085675349,0.,-3.0071732989
	H,-5.2085675349,0.,-3.0071732989
	Ag,1.7127257571,0.,0.9888475796
	Ag,0.,0.,-1.9776712736
	Ag,-1.7127257571,0.,0.9888475796
	Br,7.779709616,0.,-4.4916761175
	Br,-7.779709616,0.,-4.4916761175
	Br,0.,0.,8.9832708121
	D1,0.,0.,0.,002/00121

Table S3. Molecular graph, electronic energy and geometry of the (Pz-Cu)3:X⁻n complexes.

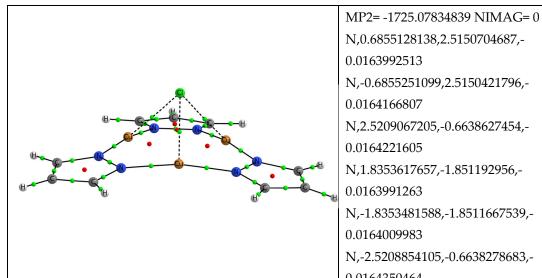
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	F,-0.0000628182,0.0000214356,-
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Ť	C,-3.8877630448,0.,0.7433775147
H~	C,-2.7008930959,0.,2.6353328471
	C,2.7008930959,0.,2.6353328471
• 1	C,3.8877630448,0.,0.7433775147
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. ,	C,4.0213397566,0.,2.1439512732
	H,-2.1783817174,0.,-4.2126404155
•	H,2.1783817174,0.,-4.2126404155
	H,-4.6403662067,0.,-0.0451031743
	H,-2.2741711033,0.,3.6389095102
ė e	H,2.2741711033,0.,3.6389095102
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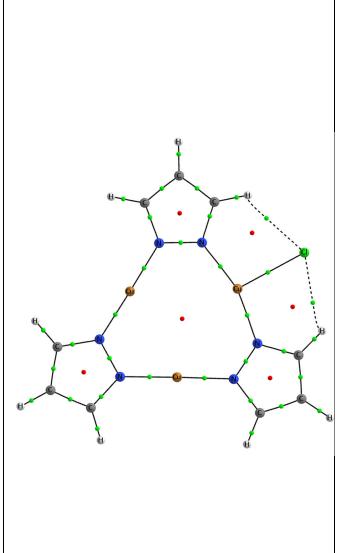


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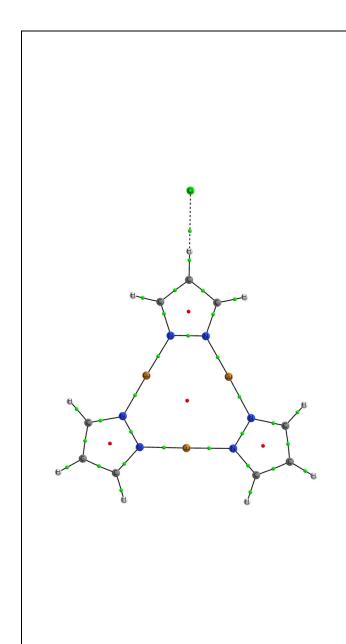
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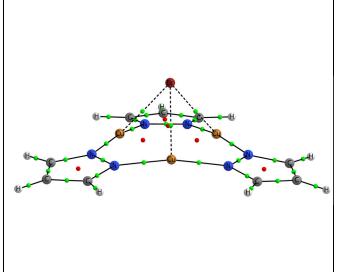


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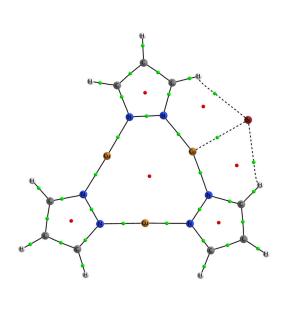
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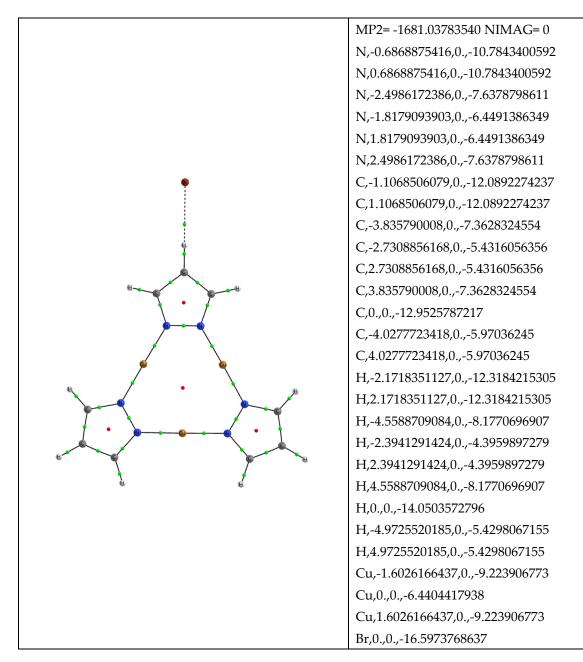
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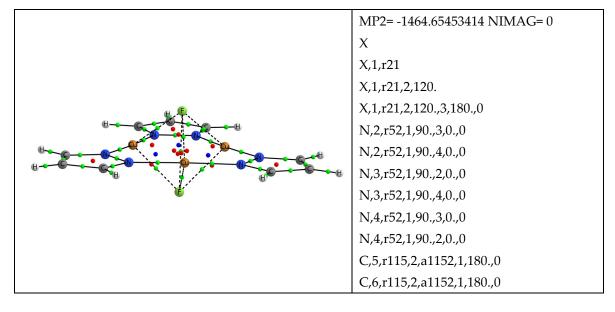
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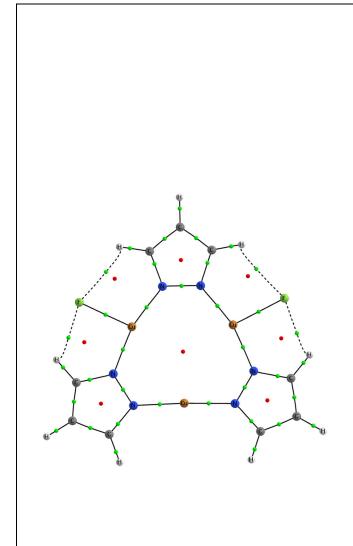
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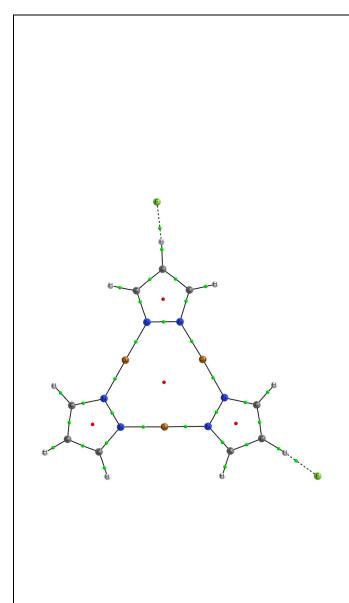


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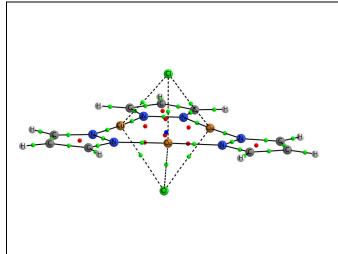
54



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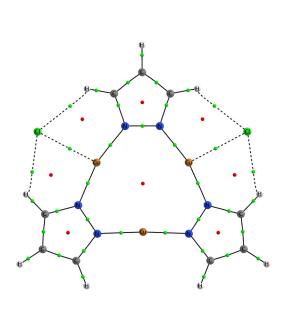


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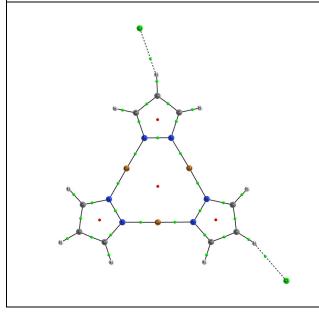
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57

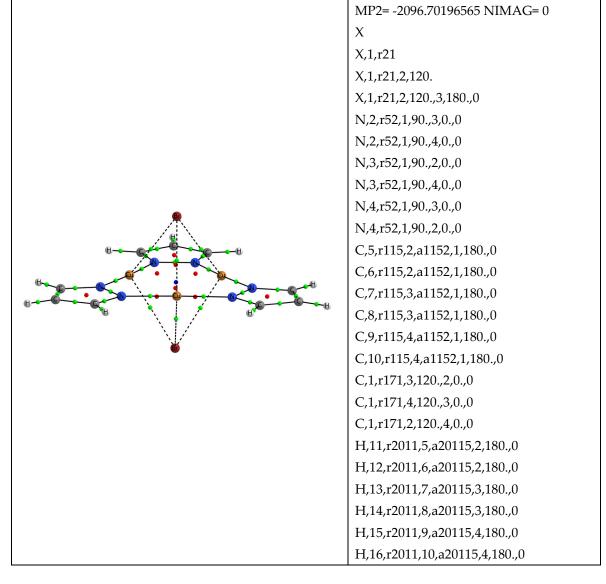


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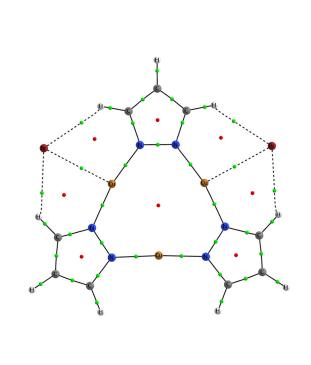


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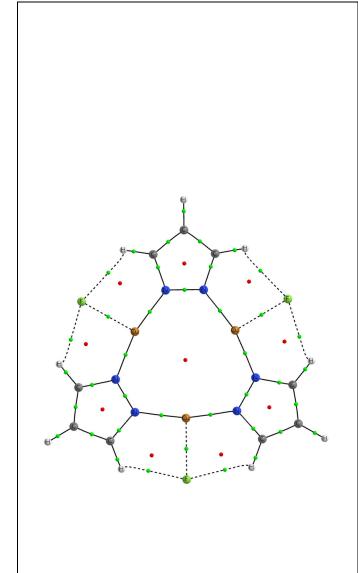


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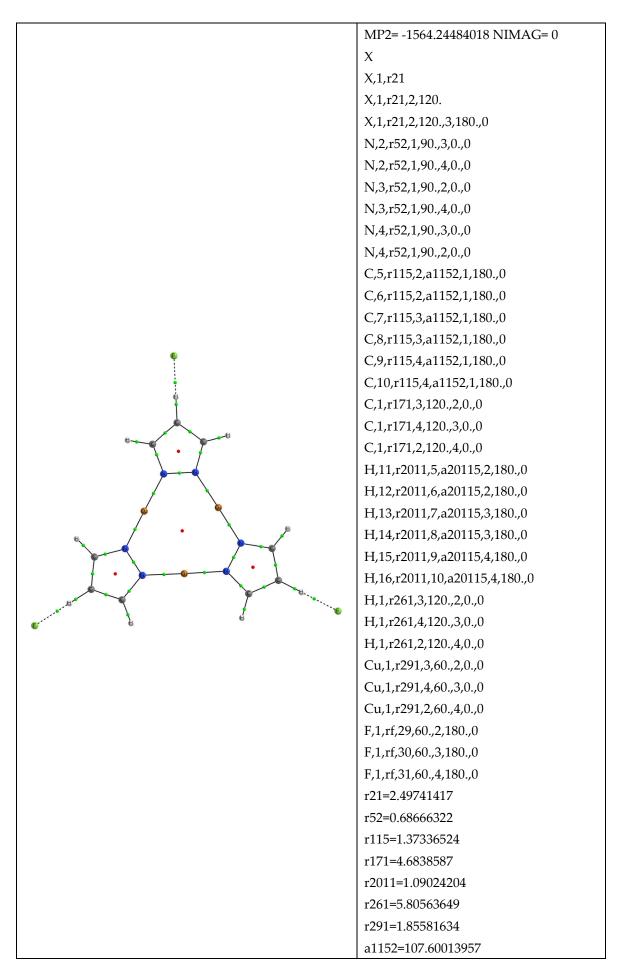


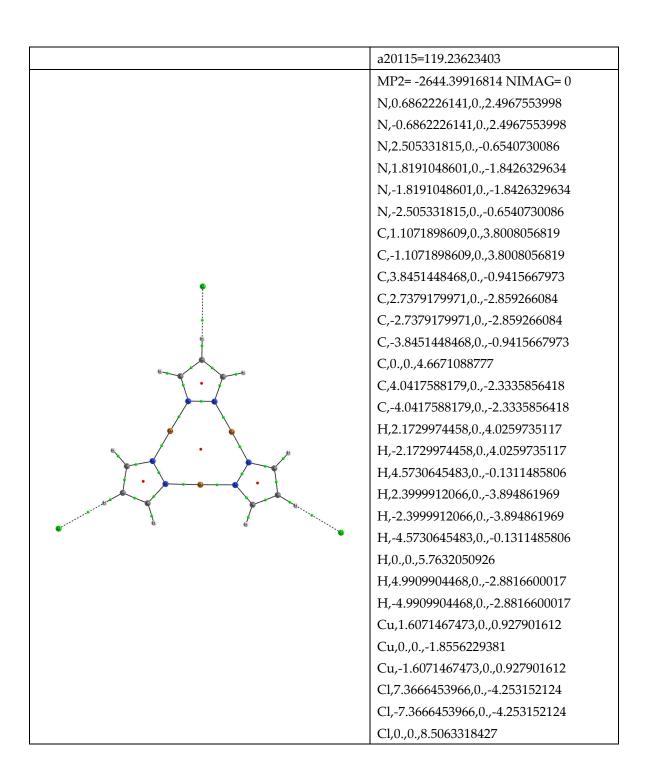
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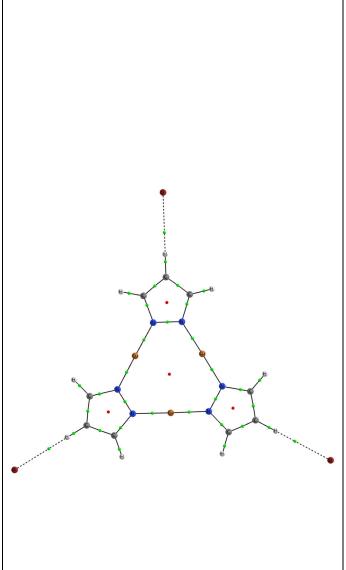
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· · ·	C,2.7438497634,0.,-2.9501104246
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e e	C,-3.8430691449,0.,-1.0260485163
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	H,-2.1792525612,0.,3.9147735387
	H,4.5767367049,0.,-0.221179178
B. T.	H,2.4081246109,0.,-3.9865194215
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Table S4. Electron density properties (au) at the intermolecular BCPs in the 1:1 complexes.

1:1 Cu complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	Cu25-F28	2.1354	0.0522	0.2611	-0.0071
Planar	F28-Cu26	2.0158	0.0683	0.3678	-0.0121
Planar	H19-F28	2.2785	0.0148	0.0541	0.0004
CH(4)	H22-F28	1.5510	0.0608	0.1809	-0.0107
Apical	Cl28-Cu25	2.5561	0.0392	0.1336	-0.0034
Planar	Cl28-Cu26	2.4297	0.0507	0.1711	-0.0084
Planar	H19-Cl28	2.5748	0.0141	0.0429	0.0009
CH(4)	H22-Cl28	2.3572	0.0192	0.0495	0.0005
Apical	Br28-Cu25	2.6924	0.0362	0.1012	-0.0040
Planar	Br28-Cu26	2.5745	0.0455	0.1243	-0.0080
Planar	H19-Br28	2.6652	0.0140	0.0404	0.0008
CH(4)	Br28-H22	2.5470	0.0160	0.0379	0.0003

1: 1 Ag complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	F28-Ag25	2.379	0.0422	0.1823	-0.0045
Planar	F28-Ag26	2.256	0.0545	0.2623	-0.0048
Planar	H19-F28	2.483	0.0094	0.0355	0.0009
CH(4)	H22-F28	1.554	0.0605	0.1800	-0.0105
Apical	Cl28-Ag25	2.758	0.0341	0.1118	-0.0026
Planar	Cl28-Ag26	2.623	0.0443	0.1474	-0.0051
Planar	H19-Cl28	2.790	0.0094	0.0272	0.0007
CH(4)	H22-Cl28	2.366	0.0188	0.0486	0.0005
Apical	Br28-Ag25	2.856	0.0337	0.0935	-0.0039
Planar	Br28-Ag26	2.722	0.0434	0.1177	-0.0072
Planar	H19-Br28	2.889	0.0093	0.0263	0.0008
CH(4)	H22-Br28	2.556	0.0157	0.0373	0.0003

1: 1 Au complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	Au25-F28	2.558	0.0358	0.1296	-0.0036
Planar	F28-Au26	2.434	0.0454	0.1776	-0.0046
Planar	H19-F28	2.336	0.0126	0.0433	0.0004
CH(4)	H22-F28	1.508	0.0676	0.1866	-0.0155
Apical	Cl28-Au25	3.017	0.0253	0.0738	-0.0005
Planar	Cl28-Au26	2.956	0.0283	0.0817	-0.0008

Planar	H19-Cl28	2.614	0.0127	0.0351	0.0006
CH(4)	H22-Cl28	2.317	0.0208	0.0537	0.0005
Apical	Br28-Au25	3.127	0.0246	0.0637	-0.0010
Planar	Br28-Au26	3.088	0.0265	0.0666	-0.0014
Planar	H19-Br28	2.706	0.0127	0.0336	0.0006
CH(4)	H22-Br28	2.507	0.0173	0.0406	0.0003

Table S5. Barriers (kJ mol^{-1}) and interhalogen distance (Å) in the maximum of the dissociation curve (Figure S1) of the 1:2 apical complexes.

	Barrier			χ)	K dista	ance
	F -	Cl-	Br-	F-	Cl-	Br-
Au	33.0	7.5	8.7	4.9	6.2	6.7
Ag	88.6	56.4	59.0	5.4	6.3	6.8
Cu	95.6	29.6	23.7	4.7	5.7	6.2

Table S6. Interatomic X···X distances (Å) in the 1:2 complexes.

F -	1:2 apical	1:2 planar	1:2 CH(4)
Au	3.534	12.219*	13.360
Ag	3.165	8.343	13.602
Cu	2.697	7.370	13.156
C1-			
Au	5.206	9.323	15.182
Ag	4.330	8.886	15.484
Cu	4.087	8.324	15.023
Br-			
Au	5.483	9.510	15.699
Ag	4.627	9.097	16.019
Cu	4.562	8.801	15.537

^{*} In this complex, the F(-) anions are interacting with the C(3)-H.

Table S7. Anion-Anion repulsion corrected binding energies (kJ/mol) for the 1:2 complexes.

F -	1:2 apical	1:2 planar	1:2 CH(4)
Au	-280.1	-149.4	-143.6
Ag	-485.4	-245.5	-120.7
Cu	-549.9	-270.8	-125.9
C1-			
Au	-127.4	-125.1	-75.7
Ag	-297.6	-182.2	-60.5
Cu	-246.5	-164.8	-64.4
Br-			
Au	-133.0	-125.9	-69.7
Ag	-285.0	-176.7	-55.5
Cu	-210.5	-147.3	-59.1

Table S8. Electron density properties (au) at the intermolecular BCPs in the 1:2 complexes.

1:2 Cu complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	F28-F29	2.6975	0.0197	0.0744	-0.0010
Apical	Cu25-F28	2.2109	0.0442	0.2059	-0.0055
Planar	F28-Cu25	2.0895	0.0577	0.2947	-0.0087
Planar	F28-H18	2.4934	0.0095	0.0383	0.0011
Planar	H16-F28	2.2599	0.0153	0.0538	0.0002
CH(4)	F28-H23	1.6591	0.0471	0.1519	-0.0043
Apical	Cl28-Cu25	2.7073	0.0293	0.0928	-0.0012
Planar	Cl28-Cu25	2.6392	0.0333	0.1072	-0.0020
Planar	Cl28-H18	2.6170	0.0127	0.0376	0.0008
Planar	H16-Cl28	2.5495	0.0146	0.0430	0.0008
CH(4)	Cl28-H23	2.5325	0.0138	0.0352	0.0004
Apical	Br28-Cu25	2.8924	0.0252	0.0650	-0.0014
Planar	Cu25-Br28	2.9624	0.0222	0.0539	-0.0011
Planar	H18-Br28	2.7206	0.0123	0.0340	0.0007
Planar	H16-Br28	2.6397	0.0144	0.0392	0.0006
CH(4)	Br28-H23	2.7562	0.0110	0.0275	0.0005

1:2 Ag complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	Ag26-F28	2.437	0.0372	0.1526	-0.0042
Planar	F28-Ag25	2.327	0.0467	0.2100	-0.0046
Planar	H16-F28	2.179	0.0173	0.0555	-0.0004
CH(4)	F28-H23	1.660	0.0470	0.1514	-0.0043
Apical	Cl28-Ag25	2.845	0.0287	0.0923	-0.0015
Planar	Cl28-Ag25	2.734	0.0354	0.1156	-0.0028
Planar	H16-Cl28	2.720	0.0106	0.0301	0.0006
Planar	Cl28-H18	2.971	0.0068	0.0200	0.0007
CH(4)	Cl28-H23	2.538	0.0137	0.0348	0.0004
Apical	Br28-Ag25	2.949	0.0282	0.0785	-0.0023
Planar	Br28-Ag25	2.849	0.0340	0.0932	-0.0039
Planar	Br28-H18	3.001	0.0075	0.0216	0.0008
Planar	H16-Br28	2.827	0.0103	0.0286	0.0007
CH(4)	Br28-H23	2.775	0.0107	0.0269	0.0005

1:2 Au complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Apical	Au25-F28	2.613	0.0320	0.1118	-0.0032

Planar	F28-H16	1.592	0.0552	0.1725	-0.0074
CH(4)	F28-H23	1.619	0.0517	0.1635	-0.0061
Apical	Cl28-Au25	3.226	0.0174	0.0482	0.0002
Planar	Au26-Cl29	3.325	0.0148	0.0391	0.0003
Planar	H16-Cl28	2.591	0.0130	0.0340	0.0005
Planar	Cl28-H18	2.977	0.0065	0.0179	0.0005
CH(4)	Cl28-H23	2.478	0.0153	0.0391	0.0005
Apical	Br28-Au25	3.339	0.0169	0.0436	0.0001
Planar	Br29-Au26	3.455	0.0140	0.0349	0.0003
Planar	H16-Br28	2.727	0.0120	0.0304	0.0005
Planar	H18-Br28	2.996	0.0074	0.0198	0.0006
CH(4)	Br28-H23	2.696	0.0123	0.0304	0.0005

Table S9. Interatomic distances (Å) of the anions in the 1:3 complexes.

F(-)	Planar	CH(4)
Au		13.361
Ag	8.158	13.573
Cu	7.450	13.141
C1(-)	planar	CH(4)
Au		14.866
Ag	9.038	15.169
Cu		14.733
Br(-)	planar	CH(4)
Au		15.226
Ag	9.353	15.559
Cu		15.120

Table S10. Anion-Anion repulsion corrected binding energies (kJ/mol) in the 1:3 complexes.

F(-)	Planar	CH(4)
Au		-175.8
Ag	-286.3	-146.8
Cu	-307.4	-153.3
C1(-)	planar	CH(4)
Au		-92.3
Ag	-201.0	-71.7
Cu		-76.6
Br(-)	planar	CH(4)
Au		-85.6
Ag	-193.4	-66.0
Cu		-70.7

 $\textbf{Table S11.} \ Electron \ density \ properties \ at the intermolecular \ BCPs \ in the \ 1:3 \ complexes.$

1:3 Cu complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Planar	F28-Cu25	2.2108	0.0443	0.2049	-0.0053
Planar	F28-H16	2.3875	0.0116	0.0425	0.0007
CH(4)	F30-H22	1.7813	0.0357	0.1149	-0.0018
CH(4)	H22-Cl30	2.7431	0.0093	0.0231	0.0003
CH(4)	Br30-H22	2.9699	0.0074	0.0182	0.0005

1:3 Ag complexes

Configuration	Atoms	Dist	Rho	Lap	Н
Planar	Ag27-F30	2.411	0.0392	0.1624	-0.0042
Planar	F28-H16	2.461	0.0098	0.0350	0.0007
CH(4)	F30-H22	1.777	0.0360	0.1160	-0.0019
Planar	Cl30-Ag27	3.025	0.0204	0.0615	-0.0002
Planar	H16-Cl28	2.863	0.0081	0.0225	0.0006
CH(4)	Cl28-H23	2.740	0.0094	0.0232	0.0003
Planar	Br30-Ag27	3.238	0.0166	0.0448	0.0001
Planar	H16-Br28	2.942	0.0082	0.0223	0.0007
CH(4)	H24-Br29	2.969	0.0074	0.0182	0.0005

1:3 Au complexes

Configuration	Atoms	Dist	Rho	Lap	Н
CH(4)	F30-H22	1.735	0.0395	0.1280	-0.0025
CH(4)	H22-Cl30	2.651	0.0110	0.0273	0.0003
CH(4)	H22-Br30	2.864	0.0089	0.0217	0.0005

Table S12. Anion-Metal distances in the CSD search.

Cu-F

Refcode	Distances (Å)				
HUXWUU	2.383 2.579 2.482				
HUXWUU	2.605 2.536 2.448				
	Average	Maximum	Minimum		
	2.506	2.605	2.383		

Cu-Cl

Refcode	Distances (Å)				
JALKIT	2.622	2.424	2.486		
OBOQAY	2.359	2.545	2.923		
OBOQEC	2.361	2.549	2.931		
OBOQIG	2.354	2.560	2.977		
RETQIR	2.500	2.584	2.558		
RETQIR	2.628	2.501	2.614		
RUYGUN	2.461	2.453	3.056		
RUYGUN	2.641	2.965	2.350		
RUYGUN	2.486	2.398	3.039		
RUYGUN	2.756	2.756	2.341		
RUYHAU	2.600	2.986	2.357		
UWOMAW	2.626	2.502	2.630		
UWOMAW	2.648	2.761	2.581		
VADYAB	2.623	2.603	2.603		
VAZCUX	2.527	2.631	2.666		
VAZCUX	2.604	2.527	2.564		
	Average	Maximum	Minimum		
	2.609	3.056	2.341		

Cu-Br

Refcode	Distances (Å)				
ELODIS	2.722 3.063 2.504				
ELODOY	2.652	2.750	2.645		
ELODOY	2.698 2.638 2.806				
	Average	Maximum	Minimum		
_	2.720 3.063 2.504				

Figure S1. Energy profiles (kJ/mol) as a function of the X-X distance (Å) in the 1:2 apical complexes. Only one of the X anions in move further away from the (Pz-M)₃·X⁻ system.

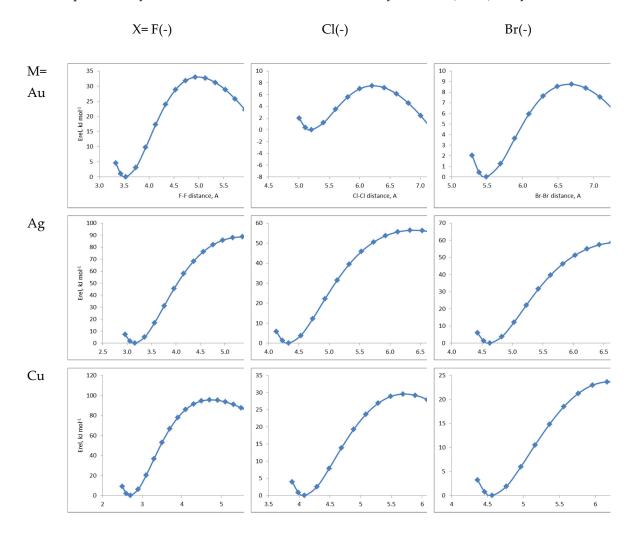
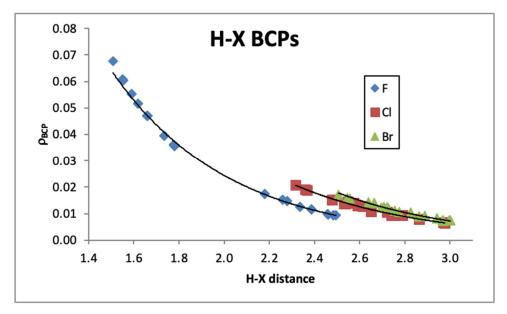
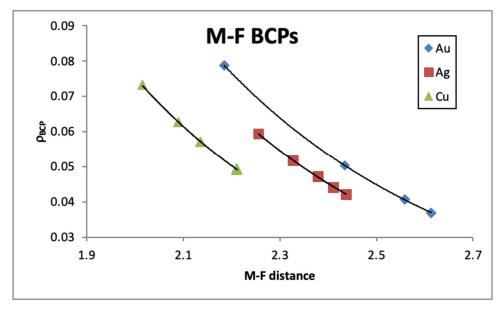


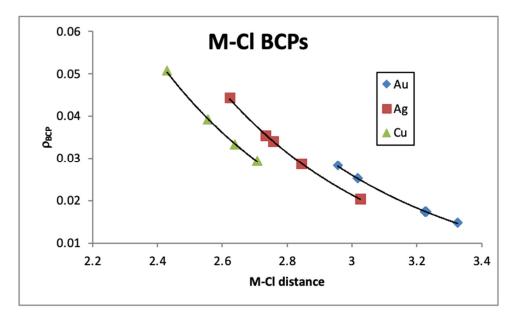
Figure S2. Electron density at the BCP (au) vs. the interatomic distance (Å).



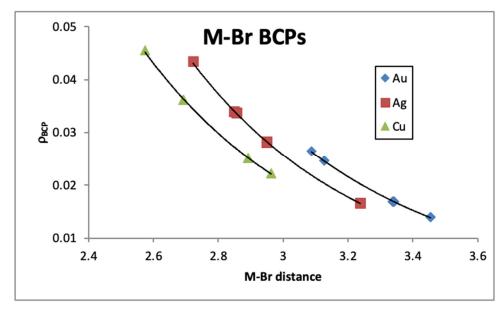
The exponential relationships show R² values of 0.998 (H-F), 0.98 (H-Cl) and 0.98 (H-Br).



The exponential relationships show R^2 values > 0.999.



The exponential relationships show R^2 values > 0.999.



The exponential relationships show R^2 values > 0.99.