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## Complexation of Nitrous Oxide by Frustrated Lewis Pairs

Otten, Edwin; Neu, Rebecca C.; Stephan, Douglas W.

*Published in:*  
Journal of the American Chemical Society

*DOI:*  
[10.1021/ja904377v](https://doi.org/10.1021/ja904377v)

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*Document Version*  
Publisher's PDF, also known as Version of record

*Publication date:*  
2009

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Otten, E., Neu, R. C., & Stephan, D. W. (2009). Complexation of Nitrous Oxide by Frustrated Lewis Pairs. *Journal of the American Chemical Society*, 131(29), 9918-9919. <https://doi.org/10.1021/ja904377v>

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on F, with F set to zero for negative F2. The threshold expression of
F2 > 2sigma(F2) is used only for calculating R-factors(gt) etc. and is
not relevant to the choice of reflections for refinement. R-factors based
on F2 are statistically about twice as large as those based on F, and R-
factors based on ALL data will be even larger.
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O1 O 0.67854(10) 0.34845(8) 0.20302(7) 0.0171(2) Uani 1 1 d . . .
B1 B 0.71524(17) 0.23685(14) 0.28185(12) 0.0162(3) Uani 1 1 d . . .

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F3 F 1.06952(9) 0.30877(9) 0.58813(7) 0.0306(2) Uani 1 1 d . . .  
F4 F 0.90878(10) 0.11771(8) 0.61482(7) 0.0323(2) Uani 1 1 d . . .  
F5 F 0.74767(10) 0.08483(7) 0.47383(7) 0.0283(2) Uani 1 1 d . . .  
F6 F 0.93202(9) 0.32561(7) 0.13621(7) 0.0254(2) Uani 1 1 d . . .  
F7 F 1.09459(10) 0.20039(9) 0.04203(7) 0.0372(2) Uani 1 1 d . . .  
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F9 F 0.91212(10) -0.15077(8) 0.22194(7) 0.0306(2) Uani 1 1 d . . .  
F10 F 0.73953(9) -0.02781(7) 0.31383(7) 0.0270(2) Uani 1 1 d . . .  
F11 F 0.53877(9) 0.27366(8) 0.44767(6) 0.0244(2) Uani 1 1 d . . .  
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F13 F 0.13323(9) 0.11806(8) 0.35998(8) 0.0338(2) Uani 1 1 d . . .  
F14 F 0.27811(9) 0.04631(8) 0.21525(7) 0.0310(2) Uani 1 1 d . . .  
F15 F 0.54534(9) 0.09092(8) 0.18370(6) 0.0242(2) Uani 1 1 d . . .  
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C7 C 0.81876(14) 0.15689(12) 0.22642(10) 0.0171(3) Uani 1 1 d . . .  
C8 C 0.91605(15) 0.20797(13) 0.15767(11) 0.0194(3) Uani 1 1 d . . .  
C9 C 1.00424(15) 0.14471(14) 0.10839(11) 0.0240(3) Uani 1 1 d . . .  
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H20B H 0.4804 0.6743 -0.0285 0.040 Uiso 1 1 calc R . .  
H20C H 0.6342 0.6483 0.0106 0.040 Uiso 1 1 calc R . .  
C21 C 0.39969(17) 0.84960(13) 0.05991(12) 0.0265(4) Uani 1 1 d . . .  
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H21B H 0.3747 0.8784 0.1157 0.040 Uiso 1 1 calc R . .  
H21C H 0.3183 0.8196 0.0368 0.040 Uiso 1 1 calc R . .  
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H22B H 0.7204 0.7385 0.1317 0.041 Uiso 1 1 calc R . .  
H22C H 0.6263 0.8266 0.1760 0.041 Uiso 1 1 calc R . .  
C23 C 0.46895(15) 0.65009(13) 0.30562(11) 0.0200(3) Uani 1 1 d . . .  
C24 C 0.40627(18) 0.77397(14) 0.30767(12) 0.0263(3) Uani 1 1 d . . .  
H24A H 0.4145 0.7868 0.3710 0.039 Uiso 1 1 calc R . .  
H24B H 0.3089 0.7797 0.2901 0.039 Uiso 1 1 calc R . .  
H24C H 0.4563 0.8325 0.2631 0.039 Uiso 1 1 calc R . .  
C25 C 0.39040(17) 0.55847(14) 0.37990(11) 0.0262(3) Uani 1 1 d . . .  
H25A H 0.3996 0.5744 0.4422 0.039 Uiso 1 1 calc R . .  
H25B H 0.4297 0.4809 0.3807 0.039 Uiso 1 1 calc R . .  
H25C H 0.2928 0.5629 0.3632 0.039 Uiso 1 1 calc R . .  
C26 C 0.62400(17) 0.63845(15) 0.33751(12) 0.0271(4) Uani 1 1 d . . .  
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H26B H 0.6773 0.6951 0.2935 0.041 Uiso 1 1 calc R . .  
H26C H 0.6615 0.5603 0.3382 0.041 Uiso 1 1 calc R . .  
C27 C 0.27581(15) 0.57440(13) 0.15708(11) 0.0202(3) Uani 1 1 d . . .  
C28 C 0.15581(16) 0.65282(14) 0.18625(13) 0.0279(4) Uani 1 1 d . . .  
H28A H 0.0670 0.6250 0.1726 0.042 Uiso 1 1 calc R . .  
H28B H 0.1641 0.7328 0.1508 0.042 Uiso 1 1 calc R . .  
H28C H 0.1616 0.6495 0.2536 0.042 Uiso 1 1 calc R . .  
C29 C 0.26042(16) 0.44471(13) 0.21121(12) 0.0257(3) Uani 1 1 d . . .  
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H29B H 0.2698 0.4382 0.2788 0.039 Uiso 1 1 calc R . .  
H29C H 0.3322 0.3957 0.1900 0.039 Uiso 1 1 calc R . .  
C30 C 0.26216(18) 0.57795(15) 0.04976(12) 0.0292(4) Uani 1 1 d . . .  
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O1 0.0171(5) 0.0156(5) 0.0178(5) -0.0034(4) 0.0006(4) 0.0048(4)  
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C17 0.0218(7) 0.0153(7) 0.0273(8) -0.0057(6) -0.0089(6) -0.0001(6)  
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C19 0.0249(8) 0.0147(7) 0.0199(8) -0.0015(6) 0.0038(6) 0.0006(6)  
C20 0.0370(9) 0.0218(8) 0.0195(8) -0.0012(6) 0.0064(7) 0.0030(7)  
C21 0.0331(9) 0.0161(7) 0.0277(9) -0.0013(6) 0.0026(7) 0.0035(6)  
C22 0.0266(8) 0.0239(8) 0.0321(9) -0.0053(7) 0.0076(7) -0.0067(6)  
C23 0.0231(8) 0.0211(7) 0.0173(8) -0.0080(6) 0.0000(6) 0.0005(6)  
C24 0.0336(9) 0.0244(8) 0.0230(9) -0.0106(7) 0.0028(7) 0.0017(7)  
C25 0.0325(9) 0.0276(8) 0.0174(8) -0.0034(6) 0.0026(7) 0.0004(7)  
C26 0.0265(8) 0.0327(9) 0.0247(9) -0.0120(7) -0.0064(7) 0.0005(7)  
C27 0.0172(7) 0.0189(7) 0.0245(8) -0.0050(6) -0.0032(6) -0.0006(6)  
C28 0.0189(8) 0.0257(8) 0.0383(10) -0.0063(7) -0.0010(7) 0.0027(6)  
C29 0.0212(8) 0.0204(8) 0.0356(10) -0.0061(7) -0.0010(7) -0.0042(6)  
C30 0.0318(9) 0.0275(8) 0.0301(9) -0.0096(7) -0.0113(7) -0.0011(7)

\_geom\_special\_details

;

All esds (except the esd in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell esds are taken into account individually in the estimation of esds in distances, angles and torsion angles; correlations between esds in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell esds is used for estimating esds involving l.s. planes.

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loop\_

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P1 C19 1.8786(15) . ?  
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P1 C27 1.8808(15) . ?  
N1 N2 1.2571(17) . ?  
N2 O1 1.3359(15) . ?  
O1 B1 1.5430(18) . ?  
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B1 C13 1.649(2) . ?  
F1 C2 1.3542(17) . ?  
F2 C3 1.3472(17) . ?  
F3 C4 1.3403(17) . ?  
F4 C5 1.3451(18) . ?  
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F^2^ > 2sigma(F^2^) is used only for calculating R-factors(gt) etc. and is
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on F^2^ are statistically about twice as large as those based on F, and R-
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F9 F 0.06709(8) -0.12687(7) 0.13508(6) 0.04550(16) Uani 1 1 d . . .
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 C5 0.0169(3) 0.0249(3) 0.0373(4) -0.0106(3) -0.0046(3) -0.0054(2)  
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 C7 0.0170(3) 0.0183(3) 0.0172(3) -0.0050(2) -0.0015(2) -0.0049(2)  
 C8 0.0223(3) 0.0249(3) 0.0250(3) -0.0104(3) 0.0019(2) -0.0102(3)  
 C9 0.0297(4) 0.0332(4) 0.0355(4) -0.0196(3) 0.0002(3) -0.0136(3)  
 C10 0.0332(4) 0.0394(5) 0.0257(4) -0.0191(3) -0.0017(3) -0.0105(3)  
 C11 0.0279(3) 0.0301(4) 0.0160(3) -0.0071(3) -0.0006(2) -0.0075(3)  
 C12 0.0212(3) 0.0203(3) 0.0163(3) -0.0044(2) -0.0020(2) -0.0055(2)  
 C13 0.0166(3) 0.0181(3) 0.0191(3) -0.0062(2) 0.0003(2) -0.0051(2)  
 C14 0.0181(3) 0.0182(3) 0.0235(3) -0.0057(2) 0.0001(2) -0.0045(2)  
 C15 0.0212(3) 0.0172(3) 0.0321(4) -0.0061(3) 0.0045(3) -0.0052(2)  
 C16 0.0247(3) 0.0243(4) 0.0460(5) -0.0152(3) 0.0045(3) -0.0121(3)  
 C17 0.0230(3) 0.0310(4) 0.0397(4) -0.0168(3) -0.0018(3) -0.0116(3)  
 C18 0.0200(3) 0.0230(3) 0.0256(3) -0.0091(3) -0.0022(2) -0.0065(2)  
 C19 0.0205(3) 0.0241(3) 0.0223(3) -0.0039(2) -0.0060(2) -0.0102(2)  
 C20 0.0337(4) 0.0457(5) 0.0204(3) -0.0056(3) -0.0062(3) -0.0205(4)  
 C21 0.0367(4) 0.0311(4) 0.0377(5) -0.0089(3) -0.0083(4) -0.0196(4)  
 C22 0.0197(3) 0.0324(4) 0.0371(4) -0.0039(3) -0.0111(3) -0.0059(3)  
 C23 0.0182(3) 0.0258(3) 0.0183(3) -0.0012(2) 0.0002(2) -0.0060(2)  
 C24 0.0192(3) 0.0393(5) 0.0293(4) -0.0035(3) 0.0042(3) -0.0081(3)  
 C25 0.0251(4) 0.0442(5) 0.0179(3) -0.0077(3) -0.0016(3) -0.0056(3)  
 C26 0.0293(4) 0.0235(4) 0.0308(4) 0.0046(3) -0.0017(3) -0.0097(3)  
 C27 0.0188(3) 0.0198(3) 0.0267(3) -0.0105(2) -0.0002(2) -0.0067(2)  
 C28 0.0317(4) 0.0198(3) 0.0340(4) -0.0021(3) -0.0041(3) -0.0114(3)  
 C29 0.0240(3) 0.0287(4) 0.0449(5) -0.0218(4) 0.0033(3) -0.0054(3)  
 C30 0.0235(3) 0.0371(4) 0.0349(4) -0.0199(3) -0.0005(3) -0.0138(3)  
 B1 0.0161(3) 0.0165(3) 0.0163(3) -0.0041(2) -0.0013(2) -0.0042(2)

\_geom\_special\_details

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All esds (except the esd in the dihedral angle between two l.s. planes)  
 are estimated using the full covariance matrix. The cell esds are taken  
 into account individually in the estimation of esds in distances, angles  
 and torsion angles; correlations between esds in cell parameters are only  
 used when they are defined by crystal symmetry. An approximate (isotropic)  
 treatment of cell esds is used for estimating esds involving l.s. planes.

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loop\_

\_geom\_bond\_atom\_site\_label\_1

\_geom\_bond\_atom\_site\_label\_2

\_geom\_bond\_distance

\_geom\_bond\_site\_symmetry\_2

\_geom\_bond\_publ\_flag

P1 N1 1.7107(6) . ?  
 P1 C19 1.8724(8) . ?  
 P1 C27 1.8760(8) . ?  
 P1 C23 1.8790(8) . ?  
 F1 C8 1.3472(10) . ?  
 F2 C9 1.3430(11) . ?  
 F3 C10 1.3394(10) . ?  
 F4 C11 1.3426(10) . ?  
 F5 C12 1.3437(9) . ?  
 F6 C14 1.3488(10) . ?  
 F7 C15 1.3436(10) . ?  
 F8 C16 1.3402(10) . ?  
 F9 C17 1.3456(11) . ?  
 F10 C18 1.3506(10) . ?  
 N1 N2 1.2602(8) . ?

O1 N2 1.3270(8) . ?  
O1 B1 1.5475(9) . ?  
C1 C2 1.3993(10) . ?  
C1 C6 1.3993(10) . ?  
C1 B1 1.6179(10) . ?  
C2 C3 1.3929(11) . ?  
C2 H2 0.9300 . ?  
C3 C4 1.3866(13) . ?  
C3 H3 0.9300 . ?  
C4 C5 1.3863(13) . ?  
C4 H4 0.9300 . ?  
C5 C6 1.3930(11) . ?  
C5 H5 0.9300 . ?  
C6 H6 0.9300 . ?  
C7 C12 1.3921(10) . ?  
C7 C8 1.3948(11) . ?  
C7 B1 1.6431(10) . ?  
C8 C9 1.3841(12) . ?  
C9 C10 1.3807(14) . ?  
C10 C11 1.3749(14) . ?  
C11 C12 1.3890(11) . ?  
C13 C18 1.3916(11) . ?  
C13 C14 1.3930(10) . ?  
C13 B1 1.6512(11) . ?  
C14 C15 1.3822(11) . ?  
C15 C16 1.3801(14) . ?  
C16 C17 1.3762(14) . ?  
C17 C18 1.3906(12) . ?  
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C19 C22 1.5382(12) . ?  
C19 C20 1.5429(12) . ?  
C20 H20A 0.9600 . ?  
C20 H20B 0.9600 . ?  
C20 H20C 0.9600 . ?  
C21 H21A 0.9600 . ?  
C21 H21B 0.9600 . ?  
C21 H21C 0.9600 . ?  
C22 H22A 0.9600 . ?  
C22 H22B 0.9600 . ?  
C22 H22C 0.9600 . ?  
C23 C24 1.5391(11) . ?  
C23 C25 1.5402(13) . ?  
C23 C26 1.5461(13) . ?  
C24 H24A 0.9600 . ?  
C24 H24B 0.9600 . ?  
C24 H24C 0.9600 . ?  
C25 H25A 0.9600 . ?  
C25 H25B 0.9600 . ?  
C25 H25C 0.9600 . ?  
C26 H26A 0.9600 . ?  
C26 H26B 0.9600 . ?  
C26 H26C 0.9600 . ?  
C27 C28 1.5375(12) . ?  
C27 C29 1.5408(11) . ?  
C27 C30 1.5415(11) . ?  
C28 H28A 0.9600 . ?  
C28 H28B 0.9600 . ?  
C28 H28C 0.9600 . ?  
C29 H29A 0.9600 . ?  
C29 H29B 0.9600 . ?  
C29 H29C 0.9600 . ?  
C30 H30A 0.9600 . ?  
C30 H30B 0.9600 . ?  
C30 H30C 0.9600 . ?

loop\_

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\_geom\_angle\_atom\_site\_label\_3  
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N1 P1 C19 102.32(3) . . ?  
N1 P1 C27 102.03(3) . . ?  
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N1 P1 C23 112.36(3) . . ?  
C19 P1 C23 112.71(4) . . ?  
C27 P1 C23 113.45(4) . . ?  
N2 N1 P1 112.85(5) . . ?  
N2 O1 B1 111.61(5) . . ?  
N1 N2 O1 111.68(6) . . ?  
C2 C1 C6 116.68(6) . . ?  
C2 C1 B1 119.25(6) . . ?  
C6 C1 B1 123.87(6) . . ?  
C3 C2 C1 121.94(7) . . ?  
C3 C2 H2 119.0 . . ?  
C1 C2 H2 119.0 . . ?  
C4 C3 C2 120.13(8) . . ?  
C4 C3 H3 119.9 . . ?  
C2 C3 H3 119.9 . . ?  
C5 C4 C3 119.16(7) . . ?  
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C3 C4 H4 120.4 . . ?  
C4 C5 C6 120.33(8) . . ?  
C4 C5 H5 119.8 . . ?  
C6 C5 H5 119.8 . . ?  
C5 C6 C1 121.75(7) . . ?  
C5 C6 H6 119.1 . . ?  
C1 C6 H6 119.1 . . ?  
C12 C7 C8 113.93(7) . . ?  
C12 C7 B1 126.75(6) . . ?  
C8 C7 B1 119.11(6) . . ?  
F1 C8 C9 115.97(7) . . ?  
F1 C8 C7 119.91(7) . . ?  
C9 C8 C7 124.09(8) . . ?  
F2 C9 C10 119.48(8) . . ?  
F2 C9 C8 121.22(9) . . ?  
C10 C9 C8 119.30(8) . . ?  
F3 C10 C11 120.23(9) . . ?  
F3 C10 C9 120.43(9) . . ?  
C11 C10 C9 119.32(8) . . ?  
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F4 C11 C12 120.62(8) . . ?  
C10 C11 C12 119.65(8) . . ?  
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F5 C12 C7 121.00(6) . . ?  
C11 C12 C7 123.71(7) . . ?  
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C14 C13 B1 119.70(6) . . ?  
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F7 C15 C16 119.91(8) . . ?  
F7 C15 C14 120.64(8) . . ?  
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F9 C17 C18 120.46(9) . . ?

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F10 C18 C13 121.61(7) . . ?  
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C21 C19 C22 109.31(7) . . ?  
C21 C19 C20 105.96(7) . . ?  
C22 C19 C20 109.66(7) . . ?  
C21 C19 P1 109.49(6) . . ?  
C22 C19 P1 111.54(6) . . ?  
C20 C19 P1 110.72(5) . . ?  
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C19 C20 H20B 109.5 . . ?  
H20A C20 H20B 109.5 . . ?  
C19 C20 H20C 109.5 . . ?  
H20A C20 H20C 109.5 . . ?  
H20B C20 H20C 109.5 . . ?  
C19 C21 H21A 109.5 . . ?  
C19 C21 H21B 109.5 . . ?  
H21A C21 H21B 109.5 . . ?  
C19 C21 H21C 109.5 . . ?  
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H21B C21 H21C 109.5 . . ?  
C19 C22 H22A 109.5 . . ?  
C19 C22 H22B 109.5 . . ?  
H22A C22 H22B 109.5 . . ?  
C19 C22 H22C 109.5 . . ?  
H22A C22 H22C 109.5 . . ?  
H22B C22 H22C 109.5 . . ?  
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C26 C23 P1 112.04(6) . . ?  
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C23 C24 H24B 109.5 . . ?  
H24A C24 H24B 109.5 . . ?  
C23 C24 H24C 109.5 . . ?  
H24A C24 H24C 109.5 . . ?  
H24B C24 H24C 109.5 . . ?  
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C23 C25 H25B 109.5 . . ?  
H25A C25 H25B 109.5 . . ?  
C23 C25 H25C 109.5 . . ?  
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H25B C25 H25C 109.5 . . ?  
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C23 C26 H26B 109.5 . . ?  
H26A C26 H26B 109.5 . . ?  
C23 C26 H26C 109.5 . . ?  
H26A C26 H26C 109.5 . . ?  
H26B C26 H26C 109.5 . . ?  
C28 C27 C29 108.66(7) . . ?  
C28 C27 C30 106.49(7) . . ?  
C29 C27 C30 110.18(7) . . ?  
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C29 C27 P1 112.10(6) . . ?  
C30 C27 P1 109.48(6) . . ?  
C27 C28 H28A 109.5 . . ?  
C27 C28 H28B 109.5 . . ?  
H28A C28 H28B 109.5 . . ?  
C27 C28 H28C 109.5 . . ?  
H28A C28 H28C 109.5 . . ?  
H28B C28 H28C 109.5 . . ?  
C27 C29 H29A 109.5 . . ?  
C27 C29 H29B 109.5 . . ?

H29A C29 H29B 109.5 . . ?  
C27 C29 H29C 109.5 . . ?  
H29A C29 H29C 109.5 . . ?  
H29B C29 H29C 109.5 . . ?  
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C27 C30 H30B 109.5 . . ?  
H30A C30 H30B 109.5 . . ?  
C27 C30 H30C 109.5 . . ?  
H30A C30 H30C 109.5 . . ?  
H30B C30 H30C 109.5 . . ?  
O1 B1 C1 105.94(5) . . ?  
O1 B1 C7 106.50(5) . . ?  
C1 B1 C7 113.85(6) . . ?  
O1 B1 C13 108.92(6) . . ?  
C1 B1 C13 105.99(5) . . ?  
C7 B1 C13 115.21(6) . . ?

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