Supporting Information

Application of Benzofuran-Derived Azadienes as Two-Carbon Building Blocks in Annulations: Chemo- and Diastereoselective Construction of Spiro-Benzofuran Scaffolds

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2. X-ray single crystal data for compound 3aa (S18-S19)
1. Copies of NMR spectra of products 3

\(^1\)H NMR (400 MHz, CDCl\(_3\)) of compound 3aa

\[^{13}\]C NMR (100 MHz, CDCl\(_3\)) of compound 3aa
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ba

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ba
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ca

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ca
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3da: inseparable diastereomers with 90:10 dr

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3da: inseparable diastereomers with 90:10 dr
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ea

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ea
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3fa: inseparable diastereomers with 90:10 dr

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3fa: inseparable diastereomers with 90:10 dr
$^{1}$H NMR (400 MHz, CDCl$_3$) of compound 3ga

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ga
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ab

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ab
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ac

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ac
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ad

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ad
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3ae

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3ae
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3af

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3af
$^1$H NMR (400 MHz, CDCl₃) of compound 3cd

$^{13}$C NMR (100 MHz, CDCl₃) of compound 3cd
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3db: inseparable diastereomers with 85:15 dr

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3db: inseparable diastereomers with 85:15 dr
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3dc

[Chemical structure and spectra image]

$^{13}$C NMR (100 MHz, CDCl$_3$) of compound 3dc

[Chemical structure and spectra image]
$^1$H NMR (400 MHz, CDCl$_3$) of compound 3dd

13C NMR (100 MHz, CDCl$_3$) of compound 3dd
2. X-ray single crystal data for compound 3aa

![Chemical structure of compound 3aa]

The X-ray source used for the single crystal X-ray diffraction analysis of compound 3aa was MoKα (λ = 0.71073), and the thermal ellipsoid was drawn at the 30% probability level.

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<tr>
<th>Property</th>
<th>Value</th>
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<td>Identification code</td>
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<td>Empirical formula</td>
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<td>Temperature</td>
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<td>Wavelength</td>
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Crystal system  Triclinic  
Space group  P-1  
Unit cell dimensions  
\[a = 11.729(3) \text{ Å} \quad \alpha = 68.946(2)^\circ.\]  
\[b = 11.733(3) \text{ Å} \quad \beta = 88.229(3)^\circ.\]  
\[c = 15.130(3) \text{ Å} \quad \gamma = 70.982(3)^\circ.\]  
Volume  1828.4(7) Å³  
Z  2  
Density (calculated)  1.248 Mg/m³  
Absorption coefficient  0.135 mm⁻¹  
F(000)  730  
Crystal size  0.6 x 0.3 x 0.1 mm³  
Theta range for data collection  2.232 to 27.103°.  
Index ranges  -15<=h<=13, -14<=k<=9, -19<=l<=16  
Reflections collected  10837  
Independent reflections  7795 [R(int) = 0.0220]  
Completeness to theta = 25.242°  98.4 %  
Absorption correction  Semi-empirical from equivalents  
Max. and min. transmission  0.7456 and 0.6654  
Refinement method  Full-matrix least-squares on F²  
Data / restraints / parameters  7795 / 0 / 462  
Goodness-of-fit on F²  1.002  
Final R indices [I>2sigma(I)]  R1 = 0.0552, wR2 = 0.1389  
R indices (all data)  R1 = 0.0873, wR2 = 0.1611  
Extinction coefficient  n/a  
Largest diff. peak and hole  0.262 and -0.490 e.Å⁻³