Supplementary Material

Ultrasound-assisted, ZnBr\textsubscript{2}-catalyzed regio- and stereoselective synthesis of novel 3,3′-dispiropyrrolidine bisoxindole derivatives via 1,3-dipolar cycloaddition reaction of an azomethine ylide

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(A) Experimental

General. The reagents and solvents were commercially available and purchased from Sigma–Aldrich and Merck, and were used without any additional purification. Ultrasonication was performed in a Parsonic 7500s Ultrasonic Bath with a frequency of 28 kHz and a power of 100 W. The liquid holding capacity of the ultrasonic cleaner tank were 6L. TLC: Silica-gel plates 60 F254 (SiO2; Merck). M.p.: Büchi melting point B-540 apparatus; in sealed capillaries; uncorrected. 1H and 13C NMR Spectra: Bruker (DRX-500 Avance) spectrometer at 500 (1H) and 125 (13C) MHz, in CDCl3 soln., at ambient temp.; δ in ppm rel. to Me4Si as internal standard, J in Hz. Signals of the 13C NMR spectra corresponding to CH, CH2, or CH3 groups are assigned from DEPT. Infrared spectra were recorded in an ATR apparatus. Mass spectrometric data (MS) were obtained by electron ionization (EI, 70 eV), chemical ionization (CI, isobutane) or electrospray ionization (ESI).

General procedure for synthesis of the 3,3′-dispiropyrrrolidine bisoxindole (8a-I): A mixture of (E)-3-benzylidene-indolin-2-one 7a-I (1 mmol), isatin (147 mg, 1 mmol), sarcosine (89 mg, 1 mmol) and anhydrous ZnBr2 (20%, 45 mg, 0.2 mmol) in methanol (10 ml) was sonicated for 30 minute at room temperature (25-30 ºC). After completion of the reaction as monitored by TLC, the mixture was poured in ice cold water and the precipitates were filtered and air dried. Then the product was recrystallized from methanol to afford the pure product 8a-I.
(B) X-Ray structure of compound 8i

X-Ray Crystallography Structure of Compound 8i
(C) Copies of $^1$H and $^{13}$C NMR spectra for compounds 8

$^1$H NMR spectra for compound 8a
$^{13}$C NMR spectra for compound 8a
$^1$H NMR spectra for compound 8b
$^{13}$C NMR spectra for compound 8b
$^1$H NMR spectra for compound 8c
$^{13}$C NMR spectra for compound 8c
$^1$H NMR spectra for compound 8d
$^{13}$C NMR spectra for compound 8d
$^1$H NMR spectra for compound 8e
$^{13}$C NMR spectra for compound 8e
$^1$H NMR spectra for compound 8f
$^{13}$C NMR spectra for compound 8f
\(^1\)H NMR spectra for compound 8g
$^{13}$C NMR spectra for compound 8g
$^1$H NMR spectra for compound 8h
$^{13}$C NMR spectra for compound 8h
$^1$H NMR spectra for compound 8i
$^{13}$C NMR spectra for compound 8i
$^1$H NMR spectra for compound 8j
$^{13}$C NMR spectra for compound 8j
$^1$H NMR spectra for compound 8k
$\textsuperscript{13}$C NMR spectra for compound 8k
1H NMR spectra for compound 8l
$^{13}$C NMR spectra for compound 8l