SUPPORTING INFORMATION

for manuscript:

An Efficient Cu(II)-bis(oxazoline)-Based Polymer Immobilised Ionic Liquid Phase Catalyst for Asymmetric Carbon-Carbon Bond Fomation

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General Information

Dichloromethane was distilled from calcium hydride under a nitrogen atmosphere. Toluene was distilled from potassium under nitrogen. Diethyl ether was distilled from benzophenone ketyl under nitrogen. NMR experiments were recorded on a Bruker Avance 300 MHz NMR spectrometer using CDCl₃ as the solvent. ¹H ¹³C NMR and 19F spectra were conducted at 300, 75 and 282MHz respectively. For SEM examination, samples were mounted upon aluminium stubs with carbon tape and analysed using a FEI Quanta 250 FEG SEM at 20kV. The non-ionic sample (P-7) was coated with Au in order to prevent charging before being mounted on carbon tape. ATR IR spectra were recorded using a Perkin Elmer 100 with a horizontal plate containing a ZnSe crystal. The spectra was recorded with a wavenumber resolution of 4 cm⁻¹ following 16 scans accumulated for a single spectrum. The working temperature was 25 °C. HPLC analysis was conducted using an Agilent 1100 equipped with an UV Diode Array detector.

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Figure S2 ¹³C NMR spectrum of 1-(4-vinylbenzyl)pyrrolidine (8)





Figure S3 ¹H NMR spectrum of 1-benzyl-1-(4-vinylbenzyl)pyrrolidinium bromide (9.Br)

Figure S4 ¹³C NMR spectrum of 1-benzyl-1-(4-vinylbenzyl)pyrrolidinium bromide (9.Br)





Figure S5 ¹H NMR spectrum of 1-benzyl-1-(4-vinylbenzyl)pyrrolidinium bistriflimide (9.NTf₂)

Figure S6¹³C NMR spectrum of 1-venzyl-1-(4-vinylbenzyl)pyrrolidinium bistrifimide (9.NTf₂)





Figure S7 ¹⁹F NMR spectrum of 1-venzyl-1-(4-vinylbenzyl)pyrrolidinium bistrifimide (9.NTf₂)

Figure S8 ¹H NMR spectrum of 1,1-vis(4-vinylbenzyl)pyrrolidin-1-ium bromide (10.Br)





Figure S9¹³C NMR spectrum of 1,1-vis(4-vinylbenzyl)pyrrolidin-1-ium bromide (10.Br)

Figure S10 ¹H NMR spectrum of 1,1-vis(4-vinylbenzyl)pyrrolidin-1-ium bistriflimide (10.NTf₂)





Figure S11¹³C NMR spectrum of 1,1-vis(4-vinylbenzyl)pyrrolidin-1-ium bistriflimide (10.NTf₂)

Figure S12¹⁹C NMR spectrum of 1,1-vis(4-vinylbenzyl)pyrrolidin-1-ium bistriflimide (10.NTf₂)







Figure S14: TGA of in house synthesised IP-2







Figure S16: TGA of in house synthesised IP-4







Figure S18: TGA of commercial polymer IP-6







Figure S20: SEM of in house synthesised IP-1





Figure S21: SEM of inhouse synthesised IP-2



Figure S22: SEM of inhouse synthesised IP-3



Figure S23: SEM of inhouse synthesised IP-4



Figure S24: SEM of inhouse synthesised IP-5



WD HV mag □ HFW pressure 11/18/2013 8.7 mm 20.00 kV 500 x 597 µm 1.13e-5 Torr 4:14:17 PM pressure 11/18/2013 9.90e-6 Torr 4:16:35 PM HV 20.00 k\ - 200 µm QFE381 WD FW - 40 µm QFE38 8.8 m WD HV mag - HFW pressure 11/18/2013 8.8 mm 20.00 kV 25 000 x 11.9 µm 7.91e-6 Torr 4:20:48 PM — 3 µm – QFE381

Figure S25: SEM of inhouse synthesised IP-6

Figure S26: SEM of P-7 Au coated





Figure S27: IR of in house synthesised IP -1



Figure S28: IR of in house synthesised IP -2



Figure S29: IR of in house synthesised IP -3



Figure S30: IR of in house synthesised IP -4



Figure S31: IR of commercial polymer IP -5



Figure S32: IR of commercial polymer IP -6



Figure S33: IR of commercial polymer P -7



Figure S34: IR of in house synthesised IP-1 (top), IP-1 + catalyst A (middle) and IP-1 + catalyst A (bottom) after a Diels-Alder reaction



Figure S35: HPLC traces of the exo and endo-cycloadducts observed from a racemic reaction mixture and that obtained from a reaction using IP-4 catalyst A complex



Figure S36: HPLC traces of the aldol adducts observed from a racemic reaction mixture and that obtained from a reaction using IP-4 catalyst A complex

