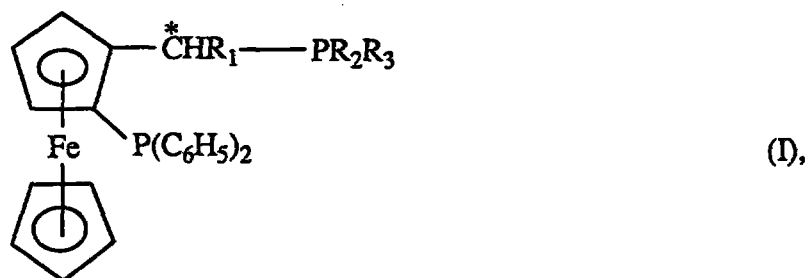


FK/6-19044/A

Ferrocenyl diphosphines as ligands for homogeneous catalysts

Abstract of the Disclosure

Compounds of formula I



wherein R_1 is C_1 - C_8 alkyl, phenyl or phenyl which is substituted by 1 to 3 C_1 - C_4 alkyl or C_1 - C_4 alkoxy groups; R_2 and R_3 are identical and are C_1 - C_{12} alkyl, C_5 - C_{12} cycloalkyl or C_1 - C_4 alkyl- or C_1 - C_4 alkoxy-substituted C_5 - C_{12} cycloalkyl, or phenyl which is substituted by one to three identical or different members selected from the group consisting of C_1 - C_4 alkyl, C_1 - C_4 alkoxy, $-\text{SiR}_4\text{R}_5\text{R}_6$, halogen, $-\text{SO}_3\text{M}$, $-\text{CO}_2\text{M}$, $-\text{PO}_3\text{M}$, $-\text{NR}_7\text{R}_8$ and $-\text{[}^\oplus\text{NR}_7\text{R}_8\text{R}_9\text{]X}^\ominus$; or R_2 and R_3 are different and are C_1 - C_{12} alkyl, C_5 - C_{12} cycloalkyl, C_1 - C_4 alkyl- or C_1 - C_4 alkoxy-substituted C_5 - C_{12} cycloalkyl, phenyl or phenyl which is substituted by one to three identical or different members selected from the group consisting of C_1 - C_4 alkyl, C_1 - C_4 alkoxy, $-\text{SiR}_4\text{R}_5\text{R}_6$, halogen, $-\text{SO}_3\text{M}$, $-\text{CO}_2\text{M}$, $-\text{PO}_3\text{M}_2$, $-\text{NR}_7\text{R}_8$ and $-\text{[}^\oplus\text{NR}_7\text{R}_8\text{R}_9\text{]X}^\ominus$; or the group $-\text{PR}_2\text{R}_3$ is a radical of formula II



and R_4 , R_5 and R_6 are each independently of one another C_1 - C_{12} alkyl or phenyl, R_7 and R_8 are H, C_1 - C_{12} alkyl, phenyl or R_7 and R_8 , taken together, are tetramethylene, pentamethylene or 3-oxa-1,5-pentylene, R_9 is H or C_1 - C_4 alkyl, M is H or an alkali metal, $\text{X}^\ominus$ is the anion of a monobasic acid, and * is a stereogenic carbon atom, in the form of their

racemates and diastereoisomers or mixtures of diastereoisomers.

Rhodium and iridium complexes with these ligands are suitable for use as homogeneous enantioselective catalysts for the hydrogenation of prochiral compounds containing carbon double bonds or carbon/hetero atom double bonds.