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## New C<sub>2</sub>-Chiral 1,1'-Bis(Oxazoline-2-YL)- Ferrocenes – Synthesis and Crystal Structure

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We report here about the synthesis of a few 1,1'-bis(oxazoline-2-yl)-ferrocene derivatives from pure bis(β-hydroxylamide)s via the reaction with methylsulfonylchloride and triethylamine. The bis(β-hydroxylamide)s were prepared from enantiomeric pure amino alcohols and 1,1'-ferrocenedicarbonyl chloride.

**Keywords:** ferrocene; oxazoline; chiral

### INTRODUCTION

For more than twenty years now chiral ferrocenes have been used in the metal catalysed enantioselective synthesis which plays an important role in preparative organic chemistry [1].

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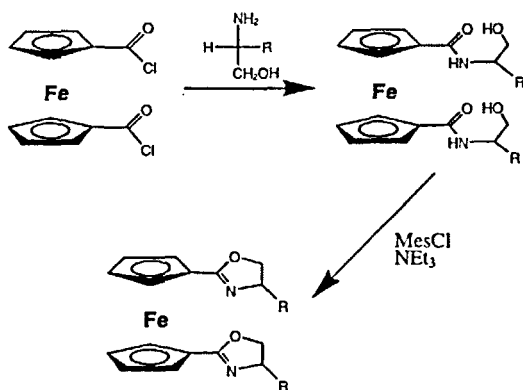
\* Corresponding author.

The demand for drugs and agro chemicals in an enantiomeric pure form leads to syntheses where racemates are avoided [2]. The major part of the enantioselective catalysts used are soluble metal complexes of low nuclearity. Alternative metal complexes with chiral ligands which are bound to an insoluble achiral polymeric matrix are also known. Heterogeneous catalysts where chiral ligands are absorbed [3] form a minority. A new approach concerns synthetic catalysts with chiral polymers as ligands. This combination is well known from natural catalysts (enzymes and DNA/RNA) [4].

#### SYNTHESIS OF 1,1'-BIS[(S)-4-ISOPROPYL-OXAZOLINE-2-YL]-FERROCENE

Under argon atmosphere a solution of 2.32 g ferrocenedicarbonyl dichloride (7.5 mmol) in 10 ml  $\text{CH}_2\text{Cl}_2$  was added very slowly to 1.55 g (S)-(+)-amino-3-methyl-1-butanol (15 mmol) and 3.88 ml triethylamine (28 mmol) in 50 ml of dry  $\text{CH}_2\text{Cl}_2$ . This reaction mixture was stirred for 72 hours, 60 ml of ether was added and it was quenched with 100 ml of saturated  $\text{NaHCO}_3$ . The organic phase was washed with 75 ml of saturated  $\text{NaCl}$ -solution and dried over  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated and the residue dried at high vacuum (yield: 81.7 %).

1.04 g 1,1'-bis[(S)-N-(1-hydroxy-3-methylbutyl)]-ferrocene diamide (2.3 mmol) and 1.33 ml triethylamine (9.6 mmol) were solvated in 30 ml dry dichloromethane under argon atmosphere. A solution of 0.63 g methanesulfonylchloride (5.5 mmol) in 10 ml  $\text{CH}_2\text{Cl}_2$  was added slowly at  $0^\circ\text{C}$ . This mixture was stirred for 48 hours, washed with cold water and saturated  $\text{NaCl}$  solution and dried over  $\text{Na}_2\text{SO}_4$ . The solvent was evaporated and the resulting solid dried at high vacuum (yield: 66.0 % on ferrocenedicarbonyl chloride).



R = (S)-ethyl, (S)-iso-propyl, (R)-iso-propyl, (S)-2-iso-butyl, (S)-3-iso-butyl, (S)-tert-butyl

FIGURE 1: A general route to synthesise several chiral ferrocene derivatives.

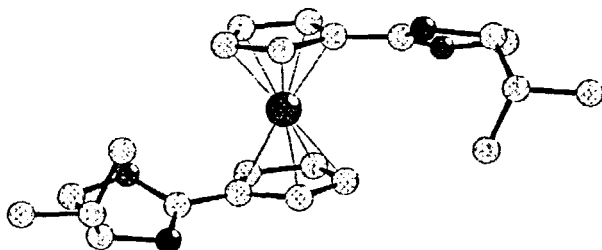


FIGURE 2: Molecular geometry of compound 1 1,1'-bis[(S)-4-isopropyl-oxazoline-2-yl]-ferrocene in crystal structure 1.

## CHARACTERISATION

The characterisation was done by  $^1\text{H}$ - and  $^{13}\text{C}$ -NMR-measurement, elemental analysis and X-ray diffraction.

### Acknowledgement

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