

Experiment proposal for

Comprehensive Organic Chemistry Experiments for the Laboratory Classroom

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Experiment title:	Analysis of racemic and (S)-ibuprofen		
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Abstract:

Chiral considerations are now essential parts of the drug research and development and of the regulatory process. Ibuprofen (4-isobutyl- α -methylphenylacetic acid) is a chiral drug widely used for the treatment of inflammatory diseases. The enantiomer with therapeutic interest is (S)-ibuprofen; however, it is commercialized in most pharmaceuticals as a racemate. The aim of this experimental work is to analyse by two different methods the racemic mixture and the (S)-enantiomer of ibuprofen. By the direct method, transient, diastereomeric interactions between ibuprofen and a chiral stationary phase lead to different retention times and thus, to the separation of the enantiomers, through high performance liquid chromatography (HPLC) with ultraviolet (UV) detection. By the indirect method, the racemic mixture of ibuprofen is allowed to react with the enantiomerically pure (S)-(-)- α -methylbenzylamine in the presence of the coupling reagent *N,N,N',N'*-tetramethyl-*O*-(benzotriazol-1-yl)uronium tetrafluoroborate (TBTU) and the two amides that are produced are diastereomers. The obtained diastereomers are analysed by thin layer chromatography (TLC). This experimental work takes a lab section with a medium hazard level and targets advanced master students. The principle involved is that enantiomers are distinguishable only if they are placed in a chiral environment and comprises concepts of analytical chromatography, chiral resolution, and synthesis of amides. The experimental techniques involved chiral HPLC-UV, stirring plates, liquid-liquid extraction, and TLC.

Graphical abstract

