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Development and Application of Image Analysis Techniques for Identification and Classification of Microscopic Particles

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Promotor: Prof. Dr. P. Van Espen

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TO MY WIFE

for her help, cooperation, patience and encouragement

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PREFACE

Besides classical spectroscopic methods, imaging methods are more and more used in analytical chemistry. Computer-based image analysis systems have became increasingly widespread over the past decades. Computers are used not only to collect information and represent it in a form of a digital image but also to improve the visual appearance of images, to prepare images for measurement of the features and to perform the measurements.

The present work discusses a number of problems where imaging methods can be applied. Different aspects of development and application of image processing and analysis techniques used to characterize and classify microscopic objects according to their shape are described. The text of the thesis is organized in three parts:

Part 1 gives an overview of image formation processes and basic image processing topics. Part of the work was devoted to writing software to perform common image processing functions and implement new techniques. Description of the software can be found here.

Part 2 is a systematic review of different mathematical aspects of shape analysis.

Part 3 consists of examples of different applications of image analysis to solve real problems.

All software, collected images, materials which were used to write articles during the study, and the thesis itself are available on CD-ROM included in this thesis.