This thesis aims at developing the new spectrophotometric detection method for the determination of halogen anions. Such ions have been usually determined by sophisticated techniques such as ion chromatography (IC), gas chromatography (GC) and capillary electrophoresis (CE). Most of these techniques need expensive instruments, high operation cost, complicated procedures and long analysis time. Therefore, such methods are not suitable for on-site routine monitoring.

Spectrophotometric detection systems are attractive alternatives because of the advantage of common available instrument, less expensive apparatus, simple procedures and sufficient accuracy. The developed spectrophotometric detection systems are easily applied to an automated system by using a flow injection (FI) technique which enables to improve a high sampling rate and a minimum sample and reagent consumption. FI technique can be configured in a wide variety of difference modes, depending on the desired application. The stopped-FI mode is the one approach for enhancing the degree of chemical reaction without increasing the dispersion of the sample zone. Therefore, in this research, the stopped-FI mode was also utilized as one of kinetic-spectrophotometric based system for the determination of bromide to obtain higher sensitivity.

In this thesis, the determination of bromide (Br\(^-\)), bromate (BrO\(_3\)), chloride (Cl\(^-\)), iodate (IO\(_3^+\)) and fluoride (F\(^-\)) by using new chromogenic reagents was achieved. The aims of this research are as follows:

1. New kinetic-spectrophotometric method for the determination of bromide was achieved by developing new colorimetric detection reactions for bromide determination based on its kinetic activity on the oxidation of methylene blue (MB) with hydrogen peroxide. Moreover, a semi-automated system for the determination of bromide by using a stopped-FI technique was developed.

2. The application of kinetic-based reaction system between methylene blue and hydrogen peroxide for chloride determination was realized.

3. New spectrophotometric method for the determination of bromate based on the oxidation reaction of perchloroperazine with bromate was developed. Moreover, the acceleration effect of chloride and bromide and their activities on the determination of bromate was, for the first time, found in this research.

4. Flow injection system for the determination of iodate was further explored by the use of the oxidation reaction of perchloroperazine for the determination of iodate.

5. Gas diffusion flow injection (GD-FI) system for the determination of iodide by using I\(_5^-\)-starch complex was developed, and applied to highly colored samples containing iodide and KI tablet.

6. New colorimetric detection system for the determination of fluoride based on the bleaching effect of fluoride on the complex formation between chromazural S and Al (III) was developed for the determination of trace amounts of fluoride ion in water samples.

The present thesis can greatly contribute to improve the halogen analysis and the clarification of the catalytic phenomena of halogen in analytical chemistry.
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In this thesis, the determination of bromide (Br\(^{-}\)), bromate (BrO\(_3\)^{-}), chloride (Cl\(^{-}\)), iodate (IO\(_3^+\)) and fluoride (F\(^{-}\)) by using new chlomogenic reagents were achieved. The aims of this research are as follows:

1. New kinetic-spectrophotometric method for the determination of bromide was achieved by developing new colorimetric detection reactions for bromide determination based on its kinetic activity on the oxidation of methylene blue (MB) with hydrogen peroxide. Moreover, a semi-automated system for the determination of bromide by using a stopped-FI technique was developed.

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4. Flow injection system for the determination of iodate was further explored by the use of the oxidation reaction of perchlorperazine for the determination of iodate.

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The present thesis can greatly contribute to improve the halogen analysis and the clarification of the catalytic phenomena of halogen in analytical chemistry.

In view of original contents and creative results obtained in this research, the committee evaluated this dissertation as PhD degree’s worth of research.