

Preface

It gives us great pleasure in presenting this book, which mainly focuses on the latest trends in the field of utilization of fly ash. Though various conventional applications of fly ash in the construction sector are very well known to the society, a considerable amount of the fly ash is still lying unused in most of the thermal power plants and hence is a potential threat to both human and environmental health. In this situation, there is a need to focus on the innovative ideas for the value addition of the fly ash and enhance its utilization.

In this context, a thorough review of state-of-the-art on the fly ash utilization and various innovative efforts made by the researchers, in the recent past, for synthesis of zeolites (popularly known as fly ash zeolites) from the fly ash are presented in this handbook. These zeolites are being used for various industrial applications such as catalysts and adsorbents for the contaminated soils and sludge. In addition, a novel methodology for purification of some low grade fly ash zeolites is presented in this book. Attempts have also been made to provide a single source of the literature on the fly ash and its recycled products (the polycrystalline fly ash zeolites) as an easy and quick reference for the researchers and industrialists.

The book is organized in the following eight chapters.

Chapter 1: Introduction

This chapter has been written to summarize the main background of writing this book.

Chapter 2: Basics of Zeolites

This chapter is about the basics of zeolites. In addition, attempts have been made to discuss about the parameters of the fly ash, which are quite crucial for synthesis of the fly ash zeolites by chemical activation method.

Chapter 3: Conventional Methods for Synthesis of Fly Ash Zeolites

This chapter showcases available methodologies for synthesis of the fly ash zeolites and some critical issues, associated with them, which need further attention of the researchers.

Chapter 4: Mechanism for Zeolitization of Fly Ash

This chapter logically presents the mechanism of chemical transformation of the fly ash into zeolites. Attempts have been made to highlight the effects of alkali activation on the overall characteristics of the fly ash. Also, a need to innovate novel methods of synthesis of the fly ash zeolites, and to improve their overall characteristics, has been the main focus of this chapter. In addition, the chapter presents details of the applications of various advanced characterization tools (viz., physico-chemical, mineralogical and morphological) for exploring the overall properties of the zeolites.

Chapter 5: Novel Technique for Synthesis and Characterization of Fly Ash Zeolites

This chapter presents innovative approach adopted by the authors for synthesis and characterization of fly ash zeolites. Also, attempts have been made to explain methods of characterization of the fly ash and the end products obtained from it. This chapter also presents a discussion on the suitability of the fly ash for its effective zeolitization.

Chapter 6: Major Findings of the Three-Step Activation Technique

This chapter deals with the inferences derived from the novel method “three step activation” of the hopper ash, which has been ascertained to be the superior ash over the lagoon ash, as described in Chapter-5, by following hydrothermal activation method. Furthermore, this chapter also showcases the outcome of the three-step activation of the fly ash by fusion method to synthesize high grade zeolite-X.

Chapter 7: Application of Fly Ash Zeolites: Case Studies

This chapter presents various applications of the fly ash and its zeolites.

Chapter 8: Path Ahead

This chapter highlights the scope of further research on the fly ash, fly ash zeolites, and the reaction by-products obtained as a result of chemical activation of the fly ash with NaOH in a hydrothermal system.

It would be our pleasure to receive critical suggestions, if any, from the readers for improving this handbook.

Fly Ash Zeolites

Innovations, Applications, and Directions

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