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Title(English)	Improvement of catalytic performance of metal-containing zeolites by modification of synthesis method
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THESIS OUTLINE

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The title of this dissertation is “Improvement of catalytic performance of metal-containing zeolites by modification of synthesis method” which consists of six chapters.

Chapter 1: This chapter provides an extensive review of zeolites, focusing on the MFI, MWW, and Beta structures. It discusses their critical features, including their topologies, framework compositions, and the resulting hydrophobic properties.

Chapter 2: This chapter explores the effects of incorporating oxalic acid as an additive in the synthesis gel of TS-1 zeolite on its crystallization behavior and physicochemical properties, along with the use of different TPAOH sources. The study examines the impact on the structure, morphology, titanium content, coordination states, and the efficiency of 1-hexene epoxidation.

Chapter 3: This study investigates the synthesis of TS-1 using various synthesis gels, followed by a defect-healing treatment to eliminate silanol defects. The catalytic efficacy of the synthesized TS-1 was rigorously assessed through the epoxidation of 1-hexene with H_2O_2 as the oxidizing agent. The results highlight the critical role of defect healing in enhancing the performance of TS-1 catalysts derived from different synthesis gels, making them more suitable for industrial applications. Furthermore, the study provides a comparative analysis of defect healing and acid treatment within the TS-1 YNU synthesis method, offering valuable insights for further optimization of these catalysts.

Chapter 4: This study investigates the catalytic conversion of propylene to propylene glycol using various types of titanosilicate catalysts, with a focus on the influence of different solvent environments. The research aims to determine how the choice of solvent affects the efficiency and selectivity of the

catalytic process in a single-pot reaction. Both polar and non-polar solvents were examined to understand their impact on the reaction mechanism and product yield. The findings provide insights into optimizing the catalytic conversion process by selecting appropriate solvent environments.

Chapter 5: This study investigates the direct synthesis of MWW-type zeolites that include Sn, and analyzes their physicochemical features. The study examined the involvement of sodium cations in the nucleation and crystallization processes, highlighting their importance in converting the amorphous gel into a crystalline phase. Furthermore, the catalytic performance of Sn-MWW synthesized through both direct and post-synthesis methods was evaluated in the conversion of dihydroxyacetone to methyl lactate and in the Baeyer-Villiger oxidation of 2-adamantanone.

Chapter 6: Overall, this dissertation underscores the immense potential of zeolite-based catalysts in various chemical reactions. Chapter 2 highlights the use of oxalic acid to synthesize TS-1 zeolites without anatase form and enhance their catalytic performance. Chapter 3 emphasizes the significance of defect healing treatment from various synthesis gel compositions. Chapter 4 elucidates the pivotal role of solvent environments in the catalytic conversion of propylene (PE) to propylene glycol (PG) using titanosilicate catalysts in a one-pot reaction. Finally, Chapter 5 demonstrates that the direct synthesis method for tin-containing MWW zeolites shows potential comparable to Sn-Beta zeolites in biomass applications, with sodium cations playing a crucial role in the crystallization process.