論文 / 著書情報
Article / Book Information

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種別(和文)	論文要旨
Type(English)	Summary

（博士課程）
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論 文 要 旨

THESIS SUMMARY

専攻： Department of	物質電子化学　専攻	申請学位（専攻分野）： Academic Degree Requested	博士（　工学　） Doctor of
学生氏名： Student's Name	王 宇楠	指導教員（主）： Academic Advisor(main)	野村　淳子
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要旨（英文 800 語程度）
Thesis Summary（approx.800 English Words ）

The aim of this study is to investigate the synthesis method, particle morphology, functionalization and catalytic performance of mesoporous metallosilicates. This thesis is composed of five chapters. Chapter I is a comprehensive review focusing on the development of mesoporous metallosilicates. Chapters II to IV are journal articles, in which Chapter IV has already been published and Chapter II and Chapter III are manuscripts ready for submission. Chapter V is a general conclusion summarizing the significance of the research done in this dissertation.

In Chapter I, there is a comprehensive review focusing on the development of mesoporous metallosilicates. Topics related to material synthesis, functionalization method, characterization, and applications on heterogeneous catalysis were discussed. Recent development of mesoporous silica nanospheres (MSNSs) was also included.

In Chapter II, catalytic activity of Ti-containing mesoporous silica nanospheres (Ti-MSNSs) in the epoxidations of various bulky olefins and selective oxidation of bulky sulfides to sulfoxides was investigated. We developed a novel and simple direct synthetic method for introducing Ti species into the framework of MSNSs. In this direct method, a stable titanium source of Ti peroxo-complex from TBOT and H2O2 was mixed with silica resource in the presence of surfactant and amino acid solution. I also studied the influence of Ti content, the pore size and the particle morphology on the catalytic performance of Ti-MSNSs.

In Chapter III, Ti-MSNSs have been silylated by employing various silylating reagents to improve the hydrophobicity. Thus silylated materials have showed high catalytic activities in various epoxidation reactions (i.e., cyclohexene, β-caryophyllene, 1-eicosene and stilbene) using tert-butyl hydroperoxide (TBHP) as an oxidant compared to the non-silylated samples. The effects of the silylating agent contents, silylation cycle times and silylation with different nanospheres morphology on the structural and catalytic properties were also investigated by using hexamethyldisilazane (HMDZ) as silylating reagent. These hydrophobic materials show remarkably high catalytic activities in the oxidation of cyclohexene with TBHP.

In Chapter IV, the successful synthesis of discrete Sn-containing mesoporous silica nanospheres (Sn-MSNSs) by a direct synthetic method was investigated. The effects of the Si/Sn atomic ratio in the synthesis gel, the pore size, the particle morphology and the hydrophobicity of Sn-MSNSs were demonstrated in detail. The particle size can be controlled by changing the stirring rate. The size of spheres decreases with an increase in the stirring rate and the size uniformity is simultaneously raised. The hydrophobicity of Sn-MSNSs was increased by increasing the calcination temperature. The catalytic performance was improved by increasing the hydrophobicity of the catalyst. Compared with bulk Sn-MCM-41, the Sn-MSNSs calcined at 1223 K demonstrated an excellent catalytic performance in the BV oxidation of 2-adamantanone with hydrogen peroxide (H2O2), achieving 91% yield in 3 h with 99% selectivity.

Finally, in Chapter V, a general summary and future prospect of this study are presented.

備考 ： 論文要旨は、和文 2000 字と英文 300 語を 1 部ずつ提出するか、もしくは英文 800 語を 1 部提出してください。
Note：Thesis Summary should be submitted in either a copy of 2000 Japanese Characters and 300 Words (English) or 1copy of 800 Words (English).
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