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Experimental **68-70**

- Materials
- Synthesis of support (nMCM-48)
- Synthesis of the catalyst (SiW_{12}/nMCM-48)
- Characterization
- Catalytic activity

Results and Discussion **70-103**

Characterization **70-78**

- Acidity Measurement
- BET surface area analysis
- Elemental analysis
- Thermogravimetric analysis
- Fourier Transform Infrared spectroscopy
- Powder X-ray Diffraction
- ^{29}Si Magic Angle Spinning Nuclear Magnetic Resonance
- Transmission Electron Microscopy

Catalytic Activity **79-103**

- Leaching test
- Esterification of levulinic acid
- Esterification of Succinic acid
- Acetalization of glycerol
- Control experiments
- Comparison of esterification reactions
- Regeneration and recycling studies

- Characterization regenerated catalyst
- Kinetic study: Determination of activation energy
- Plausible mechanism

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Experimental **113-115**

- Materials
- Synthesis of support (nMCM-48)
- Synthesis of SiW_{11}
- Synthesis of the catalyst (SiW_{11}/nMCM-48)
- Characterization
- Catalytic activity

Results and Discussion **115-145**

Characterization of SiW_{11} **115-118**

- Elemental analysis
- Thermogravimetric analysis
- Fourier Transform Infrared spectroscopy
- ^{29}Si Magic Angle Spinning Nuclear Magnetic Resonance

Characterization of catalyst **118-126**

- Acidity Measurement
- BET surface area analysis
- Elemental analysis
- Thermogravimetric analysis
- Fourier Transform Infrared spectroscopy
- Powder X-ray Diffraction

- ^{29}Si Magic Angle Spinning Nuclear Magnetic Resonance
- Transmission Electron Microscopy

Catalytic Activity **127-145**

- Leaching test
- Esterification of levulinic acid
- Esterification of Succinic acid
- Acetalization of glycerol
- Control experiments
- Comparison of esterification reactions
- Regeneration and recycling studies
- Characterization regenerated catalyst
- Kinetic study: Determination of activation energy

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Chapter 1: Parent Silicotungstic acid (SiW_{12}) anchored to MCM-22: Synthesis, Characterization and Esterification as well as Acetalization reactions **159-195**

Experimental **160-161**

- Materials
- Synthesis of the catalyst (SiW_{12}/MCM-22)
- Characterization
- Catalytic activity

Results and Discussion **161-192**

Characterization **161-169**

- Acidity Measurement

- BET surface area analysis
- Elemental analysis
- Thermogravimetric analysis
- Fourier Transform Infrared spectroscopy
- Powder X-ray Diffraction
- ^{29}Si Magic Angle Spinning Nuclear Magnetic Resonance
- Transmission Electron Microscopy

Catalytic Activity **169-192**

- Leaching test
- Esterification of levulinic acid
- Esterification of Succinic acid
- Acetalization of glycerol
- Control experiments
- Comparison of esterification reactions
- Regeneration and recycling studies
- Characterization regenerated catalyst
- Kinetic study: Determination of activation energy
- Plausible mechanism

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Experimental **200-201**

- Materials
- Synthesis of the catalyst (SiW_{11}/MCM-22)
- Characterization
- Catalytic activity

Results and Discussion **201-228**

Characterization of SiW_{11} **201**

Characterization of catalyst **201-209**

- Acidity Measurement
- BET surface area analysis
- Elemental analysis
- Thermogravimetric analysis
- Fourier Transform Infrared spectroscopy
- Powder X-ray Diffraction
- ^{29}Si Magic Angle Spinning Nuclear Magnetic Resonance
- Transmission Electron Microscopy

Catalytic Activity **209-228**

- Leaching test
- Esterification of levulinic acid
- Esterification of succinic acid
- Acetalization of glycerol
- Control experiments
- Comparison of esterification reactions
- Regeneration and recycling studies
- Characterization regenerated catalyst
- Kinetic study: Determination of activation energy

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Experimental **256-257**

- Materials
- Synthesis of catalyst
- Characterization
- Catalytic activity

Results and Discussion **257-261**

Characterization **257**

Catalytic activity **257-260**

- Control experiments
- Effect of dye concentration
- Effect of time

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