

# Recycling and Reuse Technology Transfer Center

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### **Modeling of Pyrolysis Product Formation Using Fourier Transform Ion Cyclotron Resonance Mass Spectrometry**

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**MODELING OF PYROLYSIS  
PRODUCT FORMATION USING  
FOURIER TRANSFORM ION  
CYCLOTRON RESONANCE  
MASS SPECTROMETRY**

*ENVIRONMENTAL SCIENCE  
M.S. THESIS*

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## ABSTRACT

The amount of scrap tires generated in the United States is approximately 2 million tons per year. In addition, approximately 1.5 million tons of scrap tires are generated per year in Europe. The accumulation of scrap tires in the environment has become a major concern in recent years. Pyrolysis, or thermal decomposition in the absence of oxygen, provides an effective means of reducing wastes by eliminating the scrap tires from landfills.

Pyrolysis of polyisoprene from scrap tires produces compounds of high molecular weight through secondary gas-phase reactions. Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR) was used to analyze the products formed from the pyrolysis of scrap tires. The research illustrates the fragmentation of the  $C_8H_5^+$  cation ( $m/z$  53) into the  $C_7H_4^+$  cation ( $m/z$  67), the  $C_6H_3^+$  cation ( $m/z$  81), the  $C_9H_{13}^+$  cation ( $m/z$  121), and the  $C_{10}H_{15}^+$  cation ( $m/z$  135). These results show a direct correlation between pyrolysis and combustion. This analysis will lead to a better understanding of the formation of these secondary products.