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Heat Transfer Processes in the Selective Microwave Heating of Heterogeneous Catalysts KYLE SERNIAK, Florida State University Department of Physics, MARK CROSSWHITE, A.E. STIEGMAN, Florida State University Department of Chemistry and Biochemistry — Experimental evidence has shown an unexplained increase in reaction rates during catalytic processes when heated by microwave irradiation relative to traditional thermal processes. We believe this is due to a difference in temperature between the bulk solvent and catalytic sites. In a reaction system that has a small amount of catalyst with a high absorption cross section relative to a large amount of weakly absorbing solvent, traditional measurement techniques, which take an average, will greatly underestimate the temperature on the catalytic sites. In order to correct this, we have solved a system of differential equations which describes the rate of heat transfer between each constituent in the system. Along with these solutions, data from heating experiments lets us estimate the various heat transfer constants inherent to the system as well as absorption cross sections of all components. These solutions predict a higher temperature on the catalytic sites than reported by the thermometer in the microwave system, as well as a very low heat transfer coefficient, which implies the formation of an insulating vapor barrier around the catalyst. In addition, thermal imaging data support the notion that the temperature of the catalytic sites are much higher than that of the solvent.

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