USE OF THE HIGH-PRESSURE DSC FOR CURING REACTIONS

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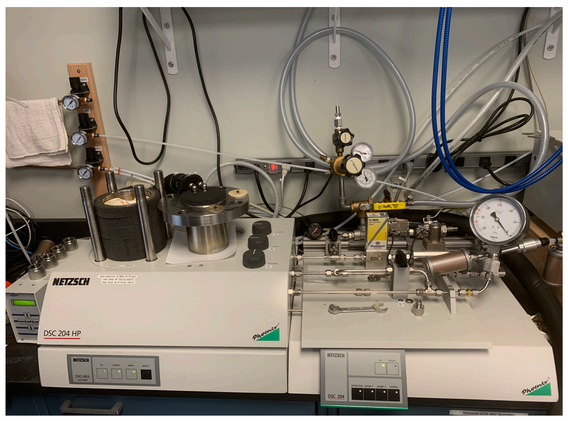
Introduction

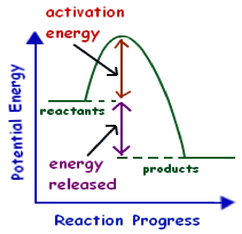
- High-pressure DSC enables the user to measure samples under specific atmospheres up to 10 MPa as a component of time or temperature.
- Higher pressure and temperature accelerates reactions and reduces the investigation time.
- The essential principles of high-pressure DSC and current applications are discussed in this poster
- High-pressure DSC is applied for research in universities, pharmaceutical, petrochemical, and chemical industries, and additionally to analyze paints, plastics, foodstuffs and electronics.
- Differential Scanning Calorimetry Device (DSC) measures the amount of energy absorbed or released while the sample is heated, cooled, or kept at a constant temperature.
- In this technique, the temperature difference between the reference and the sample is shown depending on temperature or time.

High Temperature DSC

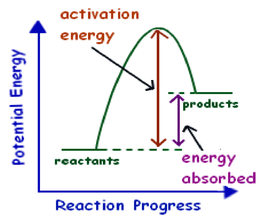


Exothermic Transition

- Chemically, reactions that give off heat while the process is taking place are called exothermic.
- During these reactions, the energy of the substance is significantly reduced. As long as the reaction continues, the substance continues to give off heat.
- It is also possible to express it as a reaction or process form that releases energy in the form of heat.
- With the given heat and temperature, cooling occurs over the reaction. Thus, there are many different weather events and energy changes on different materials around the world. This situation basically occurs within the scope of the exchange energy between heat and coldness.



Exothermic reaction



Endothermic reaction

Endothermic Transition

- The energy absorbed during an endothermic reaction provides the activation energy for the reactions to take place. The general hallmark of such an endothermic reaction is that it feels cold. In addition,
- They receive heat from the outside while performing endothermic reactions. In this way, the overall activation energy of the endothermic reaction is provided. In addition, the energy of substances increases in endothermic reactions.

DSC Curve

- The result of a DSC experiment is a curve of heat flux versus temperature or time. This curve can be used to calculate enthalpies of transitions, which is done by integrating the peak corresponding to a given transition.

Factors Affecting DSC Curve

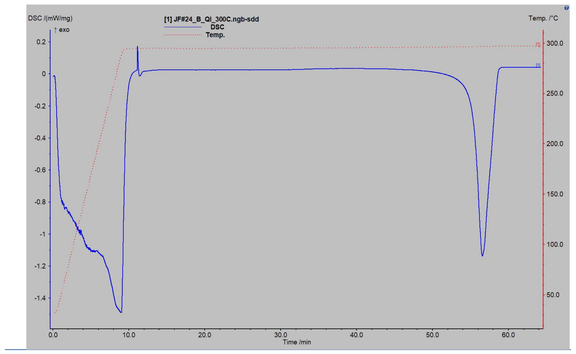
- Furnace heating rate
- Recording or chart speed
- Furnace atmosphere
- Geometry of sample holder/location of sensors
- Sensitivity of the recording system
- Composition of sample containers
- Amount of sample
- Nature of sample
- Sample packing
- Solubility of evolved gases in the sample
- Particle size
- Heat of reaction
- Thermal conductivity

DSC Evaluation of Jet Fuel #24_B

- Jet fuels are primarily derived from crude oil, the common name for liquid petroleum. These jet fuels can be referred to as petroleum-derived jet fuels.
- Jet fuels can also originate from an organic material found in shale, called kerogen or petroleum solids: that can be converted by heat to shale oil.

Results and Discussion

- JF# 24 DSC curve shows a loss of mass at 300 C temperature
- This fuel shows a steady flow for 55 minutes at 300 C
- Then, an evaporation starts drastically
- This means that this fuel can be effectively used under these conditions



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