

Application Note AN N525

Monitoring the Processes of Trimellitic Anhydride using FT-NIR Spectroscopy

Trimellitic Anhydride is a reactive chemical that offers many industrial uses, e.g. in the production of epoxy resins, wire enamels, coatings, vinyl floorings, adhesives, dyes, printing inks, pharmaceuticals and agrochemicals.

One way of producing Trimellitic Anhydride is the batchwise reaction of Pseudocumene with Acetic Acid in the presence of water and a heavy metal oxidation catalyst. To optimize the conversion rate and thus the yield in the following distillation step, it is crucial to control the concentration of each educt prior to the reaction. Here FT-NIR allows the instant feedback of concentration values directly to the DCS of the plant.

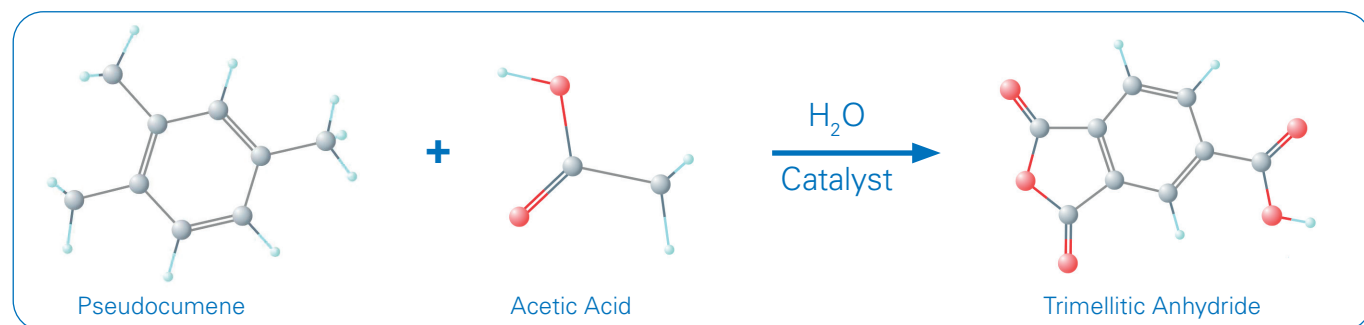
Measurement accessories and software

A flow cell with an optical path length of 5mm and a Titanium body was installed behind the two tanks carrying the Acetic Acid mixture in one and the Pseudocumene in the other, but prior to the reactor in order to monitor the feed of the batch.

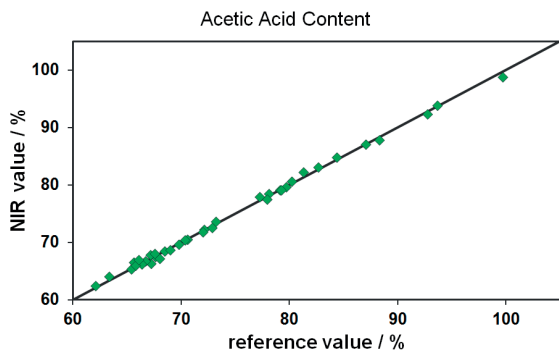
The flow cell was connected to the MATRIX-F FT-NIR spectrometer, which was located in the control room using >50m of fiber optic cables.

Summary

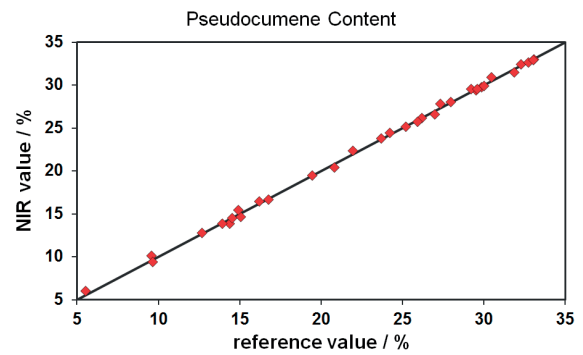
Based on the online measurements of Pseudocumene, Acetic Acid and water, the batch reaction can be tightly controlled to optimize the conversion rate of the reaction and thus improving the yield of the consecutive distillation step.



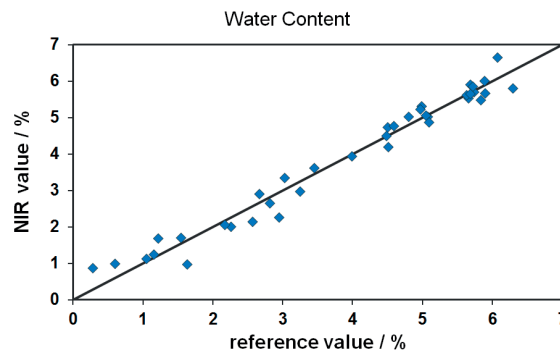
Reaction of Pseudocumene with Acetic Acid to Trimellitic Anhydride in presence of water and a catalyst.



Cross validation results of a PLS based model for the online prediction of acetic acid.



Cross validation results of a PLS based model for the online prediction of pseudocumene.



Cross validation results of a PLS based model for the online prediction of water.

FT-NIR Spectrometers: Bruker Optics offers various FT-NIR spectrometer models for lab, at-line and on-line applications:

TANGO



Touch-screen operated FT-NIR analyzer for routine use in the lab and atline.

MPA II



Multi Purpose Analyzer for maximum flexibility with ease-of-use.

MATRIX-F



Process monitoring with probes and contact-less sensor heads.

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