
3DEXPERIENCE®

# BIOVIA Allotrope Update

Allotrope Foundation

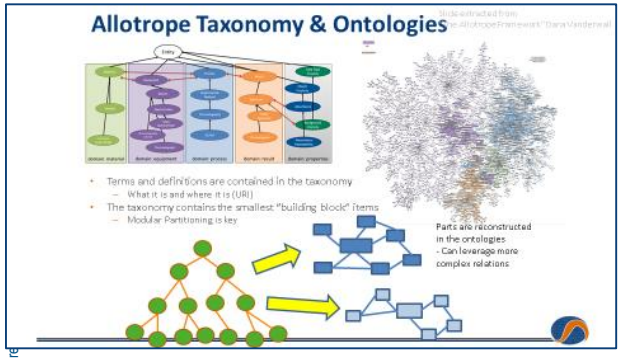
BIOVIA

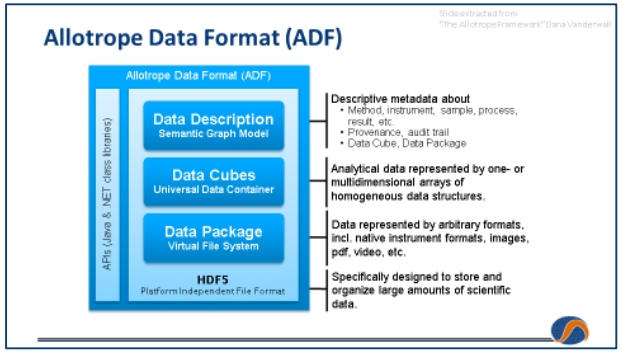
Gene Tetreault

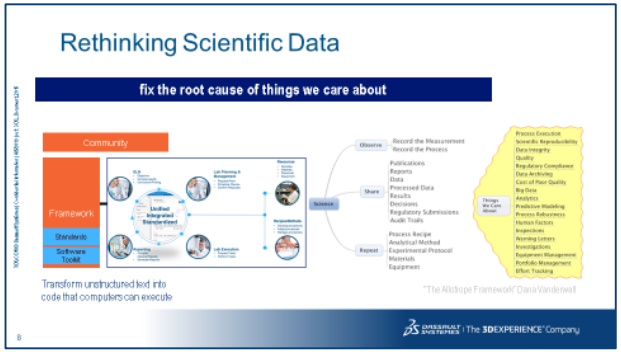
# Agenda

## BIOVIA Progress – Patrick Wheeler

## BIOVIA Plans, Next steps and aspirations – Gene Tetreault




## Initial Success -

- Defining necessary standards
- Expressing those standards for the community
- Educating the wider community in the value of data standards

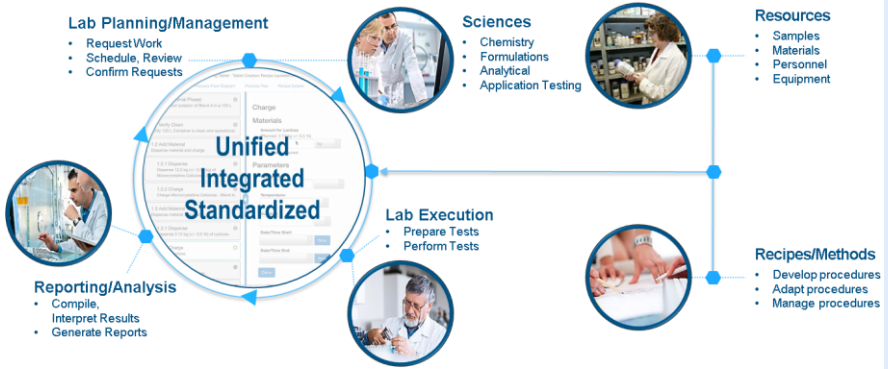
## Current Engagement -

- Successful expression of data standards for the community
- Working tools to proliferate the value of those standards
- Plans to advance implementation as the standards advance

## Ongoing Advances -

- Improved integration of data throughout and across organizations
- Improved efficiency deriving and accessing knowledge
- Extending the ways that information can transform effectiveness

# Unified Lab – Best Practice Workflows and Services




## Experiments

- Notebook
- Workbook

## Materials

- Samples
- Inventory
- Registration

## Procedures

- Compose
- Capture
- Review

## Industry Best Practices

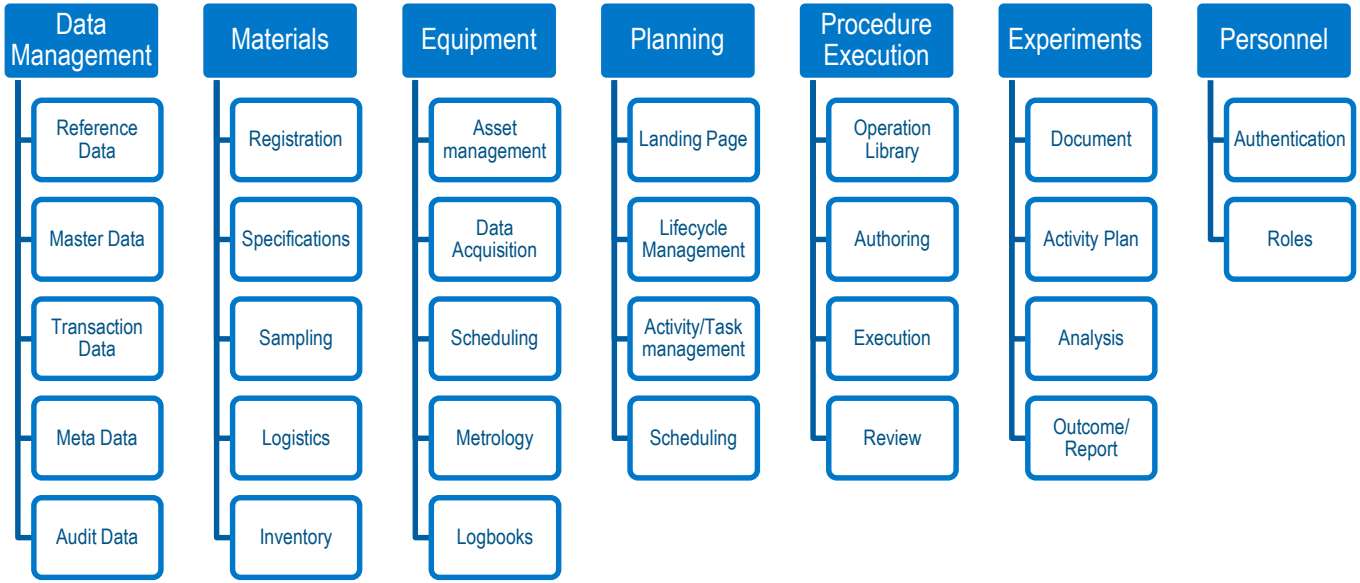
- S88 Process Libraries
- Equipment Interfaces
- Compounds

## BIOVIA Lab Services

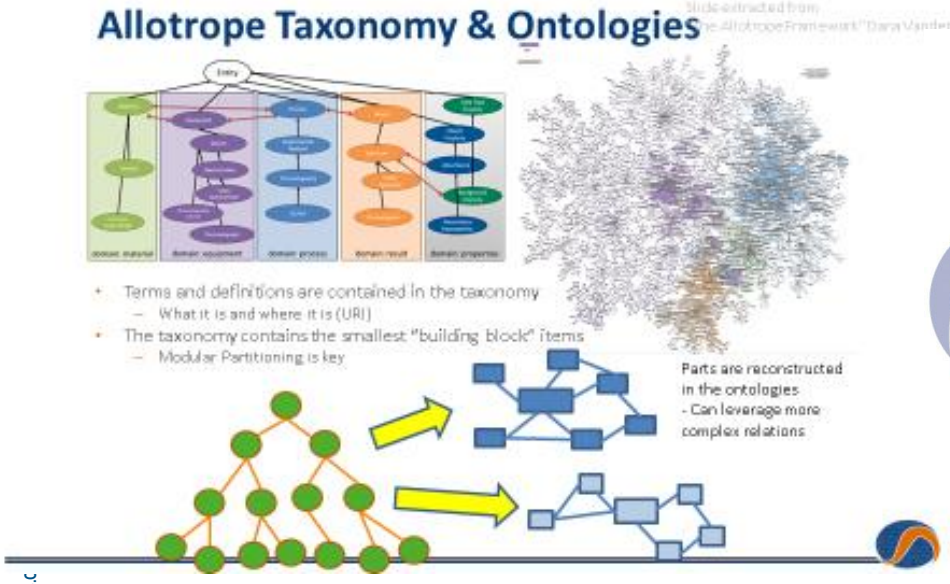
- Data Services
- Material Services
- Equipment Services
- Planning Services
- Procedure Execution Services
- Reporting Services
- Personnel Services

# Laboratory Services

- **Standardization** of scientific services and data models
- **Openness** for Dassault Systèmes ecosystem & partners
- **Scalability and compliance** (auditable, validation-ready)
- **Continuity and connection** of data across research, development, testing, and manufacturing of products
- **Designed** for highly regulated experiment-based process industries

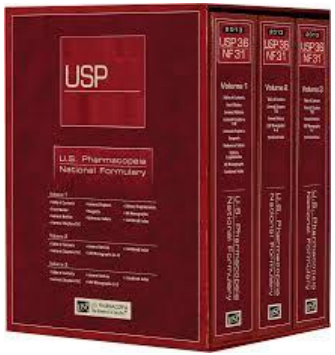


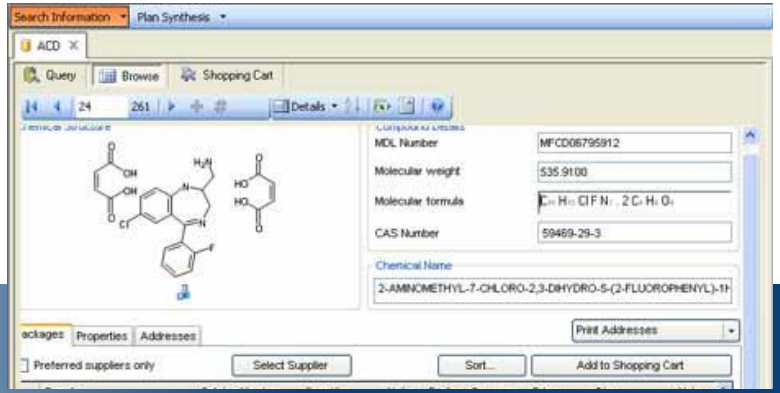
# Industry Best Practices




## S88/95


| Physical Model | Procedural Control Model |
|---|---|
| Process Cell | Procedure |
| Unit | Unit Procedure |
| Equipment Module | Operation |
| Control Module | Phase |

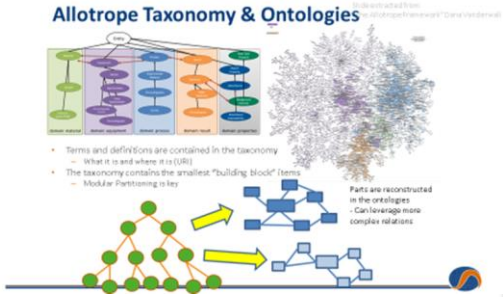





BIOVIA

# Reference Data – Taxonomies and Ontologies




Processes

Stages

Equipment | Materials | Unit Operations

Measurements | Characteristics | Actions

Parameters

Vocabularies

Units

BIOVIA

Admin and Settings

Security Events
Trusted Certificates
Users

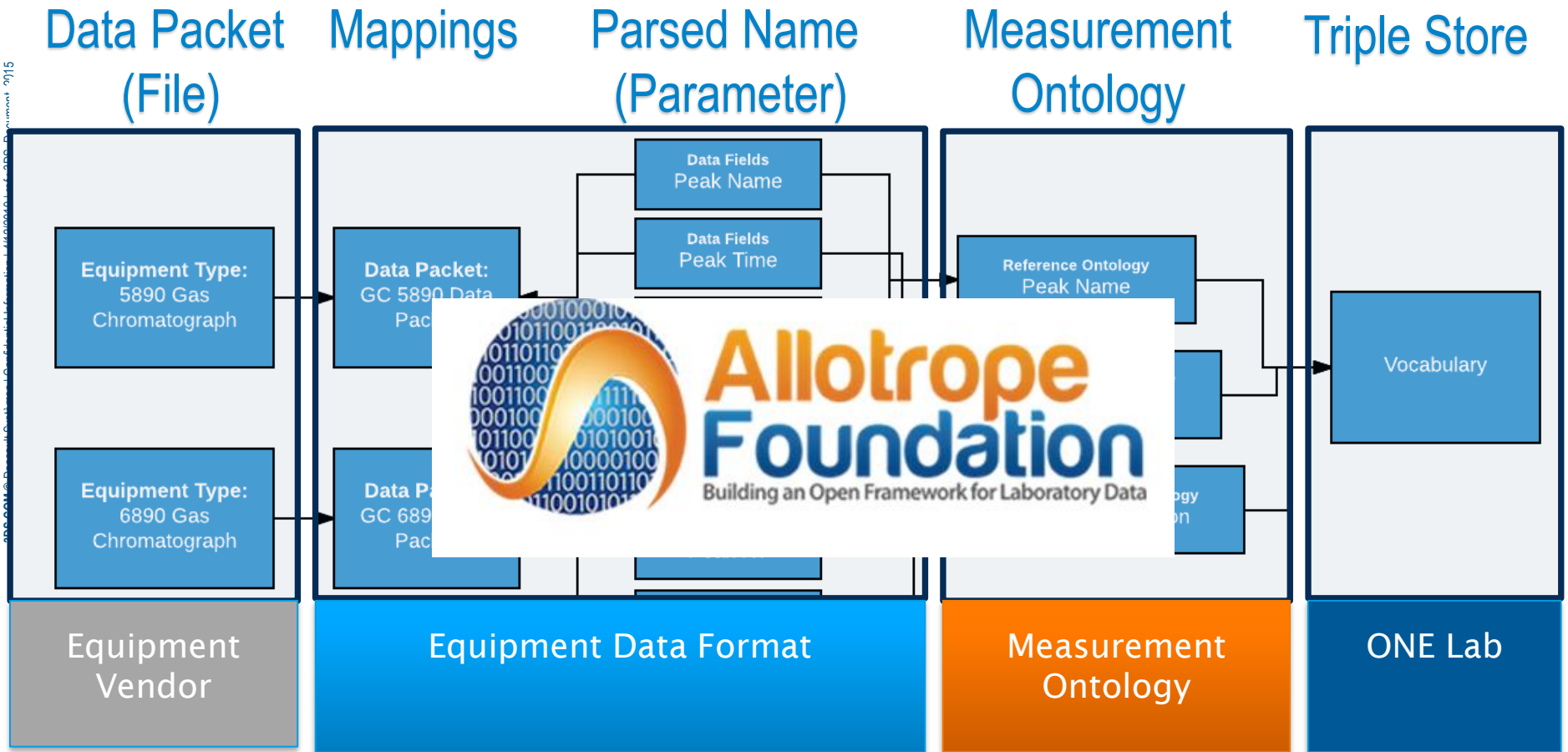
Resources
Activity Plans
Data Packets
Equipment
Locations
Organizations
Parameter Templates
Projects
Sequence Templates
Unit Types
Vocabularies

Equipment measurements & parsing

Process parameters

Units and Vocabularies

# Equipment Data Acquisition



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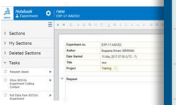
# Equipment

Direct Result Transfer | File & Database Transfer | Instrument Web Services

## Equipment Classes

| | | | |
|---|---|---|---|
| Analytical ultracentrifuge | Dynamic Vapor Sorption | Moisture Analyzer | Surface Area |
| Balance | Environmental Chamber | NMR | Tablet Press |
| Barcode Labeling | Flow Cytometry | Optical Comparator | TA-DSC |
| Bioanalyzer | Flow Meter | Osmometer | TecanMagellan |
| Calorimeter | Fluorometer | Particle Counter | Tensiometer |
| Cell Counter | Force Tester | Particle Sizer | TGA |
| Circular Dichroism | FPLC | Particle Vision System | Thermometer |
| Compression Tester | FTIR | PCR | Thermostatic Bath |
| Conductivity Meter | GC-MS | pH Meter | Titrator |
| Conductometer | Gel Imaging | Plate Reader | Turbidimeter |
| Coulometer | Hardness Tester | Plunger Inspection Device | Ultrafiltration |
| Data Hub | ICP-MS | Polarimeter | UV-Vis |
| Densitometer | Karl Fischer | Pressure Monitor | Vacuum Pump |
| Density Meter | Leak Detector | Raman | Viscometer |
| Digital Coordinate Measurement | Lyophilizer | Refractometer | Viscometer (Rheometer) |
| Dissolution Bath | Melting Point Apparatus | Robotic Drop Tester | Waterbath |
| DissoPrep | Micro Flow Imaging (MFI) | SPR | XRPD |




Existin

Accumet 950
Accumet AR15
Accumet AR20
Advanced Instruments 3250
Advanced Instruments 3300
Advanced Instruments 3D3
AND HR-200
Anton Paar DMA 4500
Anton Paar/Citizen DMA 5000
Beckman 360
Beckman 45 pH Meter
Brinkmann 756 KF Coulometer
Brinkmann Metrohm 713
Brookfield DVIII-LV
Brookfield DVIII-RV
Buchi B-540
Corning 350
Corning 540
Cosa Instruments CAVA-100
Distek 2100B
Dr. Schleuniger 8M
Fisher Scientific AR25
Fiske 210
Fluke 1523
GTB Dissoprep MX8
Hach 2100AN
Hach Ultra Met One 3400
Hanson Research SR8 Plus
Holland C50
Jenway 3020
Jenway 3320
Julabo F26MV

Mettler AT261
Mettler AX105
Mettler AX105DR
Mettler AX205
Mettler AX26
Mettler AX304
Mettler DE40
Mettler DL31
Mettler DL36
Mettler DL38
Mettler HB43
Mettler MPC227
Mettler MT5

Mettler PR5002
Mettler PR503
Mettler PR5002
Mettler PR803
Mettler RE40
Mettler SB16001
Mettler SevenCompact
Mettler SevenEasy
Mettler SevenMulti
Mettler SR16001
Mettler UMX2
Mettler WXSS205DU
Mettler XP1200-S

Ohaus V12140
Orion 150
Orion 150A
Orion 162A
Orion 250A
Orion 350
Orion 370
Orion 420A
Orion 720A
Orion 920A
Paar DMA48
Perkin Elmer 341
Photowatt Aquatest - 10

Sartorius Genius
Sartorius L 420 S
Sartorius LA200S
Sartorius LA230S
Sartorius LA310S
Sartorius LC12001S
Sartorius LC2201
Sartorius LC220S
Sartorius LC4200S
Sartorius LE2202S
Sartorius LE225D
Sartorius LE26P
Sartorius LE4202S

Sartorius MSA6.6S
Sartorius R160P
Sartorius R200-D
Sartorius RC210S
Sartorius SE2
Sartorius TE612
Shimadzu AUW1200
Sotax HT1
Stanford Research OptiMelt
Thermo Orion 150 A+
Thermo Orion 3 Star
Thermo Orion 370
Thermo Orion 4 Star

CARY 50
Cedex
Cedex HR
Circular Dichroism
Compression Tester
Digital Coordinate Measuring Machine
Dynamic Vapor Sorption
Force Tester
Fortebio

Multi-Angle static Light Scattering
Nano Drop 1000
Nova Biomedical Flex
Nova CDV
Optical Comparator
Particle Counter (Single) HIAC
Particle Counter Auto
Particle Vision System
Pendotech

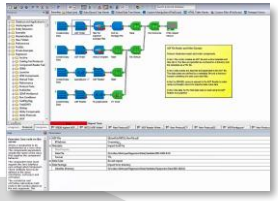
Transportation Lab Environmental Chamber
Tristar Surface Area
Varian Cary SoloVPE
Varian Spec 4000
ViCell
Viscometer (Rheometer)
VMAX
X-Ray (Xpert Data Viewer)
XRPD

# Unified Lab Management and ADF

Other

BIOVIA

*Event: "Start New Experiment*



*Select and Gather Materials*

*Prepare Solution/Sample*

*Create ADF File*

0 — Template

1 — Experiment, Inventory

2 — Experiment, Inventory

3 — PLP

Send ADF File to Reactor(s)

4 — Reactor

*Run Experiment*

5 — Reactor, Experiment, PLP

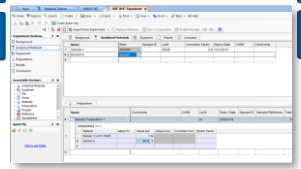
*Populate ADF File*

6 — Experiment

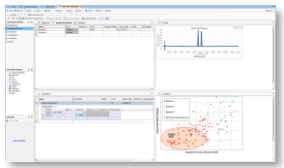
*Complete Experiment*

7 — Lake

*Data-Lake*



Send Finalized ADF File to Lake



Send ADF File back to Experiment

# What's next for Dassault Systems BIOVIA?

- What if we could read 1000's of human written methods?
- What if we could match Unit Operations, Materials, Equipment and Parameters to curated Ontologies and Taxonomies?
- What if we could automatically assemble structured executable methods requiring moderate human curation?
- What if we could automatically generate Method Validation reports?

USP 36 — Reagents / Reagent Specifications 1137

connected through a spray trap to a condenser, the end of which dips below the surface of 10 mL of 0.1 N hydrochloric acid. Add 10 mL of freshly boiled sodium hydroxide solution (1 in 10) and 500 mg of aluminum wire, in small pieces, to the Kjeldahl flask, and allow to stand for 1 hour, protected from loss of, and exposure to, ammonia. Distill 35 mL, and dilute the distillate with water to 50 mL. Add 2 mL of freshly boiled sodium hydroxide solution (1 in 10), mix, add 2 mL of alkaline mercuric-potassium iodide TS, and again mix: the color produced is not darker than that of a control containing the amount of added N (as ammonium chloride) specified in the individual test procedure.

### Phosphate in Reagents

STANDARD PHOSPHATE SOLUTION—Dissolve 143.3 mg of dried monobasic potassium phosphate, $KH_2PO_4$, in water to make 1000.0 mL. This solution contains the equivalent of 0.10 mg of phosphate ($PO_4$) in each mL.

PHOSPHATE REAGENT A—Dissolve 5 g of ammonium molybdate in 1 N sulfuric acid to make 100 mL.

PHOSPHATE REAGENT B—Dissolve 200 mg of *p*-methylaminophenol sulfate in 100 mL of water, and add 20 g of sodium bisulfite. Store this reagent in well-filled, tightly stoppered bottles, and use within one month.

PROCEDURE—[NOTE—The tests with the specimen and the control are made preferably in matched color-comparison tubes.] Dissolve the quantity of the reagent specified in the test, or the residue obtained after the prescribed treatment, in 20 mL of water, by warming, if necessary, add 2.5 mL of dilute sulfuric acid (1 in 7), and dilute with water to 25 mL. (If preferable, the test specimen or the residue may be dissolved in 25 mL of approximately 0.5 N sulfuric acid.) Then add 1 mL each of *Phosphate Reagents A* and *B*, mix, and allow to stand at room temperature for 2 hours. Compare any blue color produced with that produced in a control made with the same quantities of the same reagents as in the test with the specimen, and a volume of *Standard Phosphate Solution* equivalent to the quantity of phosphate ($PO_4$) designated in the reagent specifications.

### Residue on Ignition in Reagents

PROCEDURE—Unless otherwise directed, determine the residue on ignition as follows: Weigh accurately 1 to 2 g of the substance to be tested in a suitable crucible that previously has been ignited, cooled, and weighed. Ignite the substance, gently and slowly at first and then at a more rapid rate, until it is thoroughly charred, if organic in nature, or until it is completely volatilized, if inorganic in nature. If the use of sulfuric acid is specified, cool the crucible, add the specified amount of acid, and ignite the crucible gently until fumes no longer are evolved. Then ignite the crucible at 800 ± 25°, cool in a suitable desiccator, and weigh. If the use of sulfuric acid is not specified, the crucible need not be cooled but can be ignited directly at 800 ± 25° once the charring or volatilization is complete. Continue the ignition until constant weight is attained, unless otherwise specified.

Conduct the ignition in a well-ventilated hood, but protected from air currents, and at as low a temperature as is possible to effect the complete combustion of the carbon. A muffle furnace may be used, if desired, and its use is recommended for the final ignition at 800 ± 25°.

### Sulfate in Reagents

STANDARD SULFATE SOLUTION—Dissolve 181.4 mg of potassium sulfate (dried at 105° for 2 hours) in water to make 1000 mL. This solution contains the equivalent of 0.10 mg of sulfate ($SO_4$) per mL.

PROCEDURE—

*Method I*—Neutralize, if necessary, a solution of the quantity of the reagent or residue indicated in the test in 25 mL of water, or a solution prepared as directed in the test, with hydrochloric acid or with ammonia TS, litmus paper being used as the indicator, and add 1 mL of 1 N hydrochloric acid. Filter the solution, if necessary, through a filter paper previously washed with water, and add 2 mL of barium chloride TS. Mix, allow to stand for 10 minutes, and compare the turbidity, if any, with that produced in a control containing the same quantities of the same reagents used in the test and a quantity of *Standard Sulfate Solution* equivalent to the quantity of sulfate ($SO_4$) permitted in the test. Adjust the two solutions with water to the same volume before adding the barium chloride TS.

*Method II*—Heat to boiling the solution, prepared as directed in the individual test procedure, or the filtrate designated in the procedure, and add 5 mL of barium chloride TS. Then digest the solution on a steam bath for 2 hours, and allow to stand overnight. If any precipitate is formed, filter the solution through paper, wash the residue with hot water, and transfer the paper containing the residue to a tared crucible. Char the paper, without burning, and ignite the crucible and its contents to constant weight. Perform a blank determination concurrently with the test specimen determination, and subtract the weight of residue obtained from that obtained in the test specimen determination to obtain the weight of residue attributable to the sulfate content of the specimen.

## REAGENT SPECIFICATIONS

**Absolute Ether**—See *Ethyl Ether, Anhydrous*.

**Absorbent Cotton**—Use *Purified Cotton* (USP monograph).

**Acetal**, $C_6H_{14}O_2$—**118.2**—Use a suitable grade.

**Acetaldehyde** *(Ethanal; Acetic Aldehyde)*, $CH_3CHO$—**44.05** [75-07-0]—Colorless liquid. Miscible with water and with alcohol. Use ACS reagent grade.

**Acetanilide** *(Phenylacetamide; Antifebrin)*, $C_8H_9NO$—**135.16** [103-84-4]—White, shiny crystals, usually in scales, or a white, crystalline powder. Is stable in air. Freely soluble in alcohol and in chloroform; soluble in boiling water, in ether, and in glycerin; slightly soluble in water.

*Melting range* ⟨741⟩: between 114° and 116°.

*Reaction*—Its saturated solution is neutral to litmus.

*Loss on drying* ⟨731⟩—Dry it over sulfuric acid for 2 hours: it loses not more than 0.5% of its weight.

*Residue on ignition* ⟨Reagent test⟩: not more than 0.05%.

**Acetic Acid** *(6 N Acetic Acid)*—Use *Acetic Acid* (NF monograph) or prepare a suitable dilution of glacial acetic acid in such a way as to obtain a final concentration of acetic acid between 36.0% and 37.0%, by weight.

**Acetic Acid, Diluted** *(1 N Acetic Acid)*—Dilute 60.0 mL of glacial acetic acid with water to make 1000 mL.

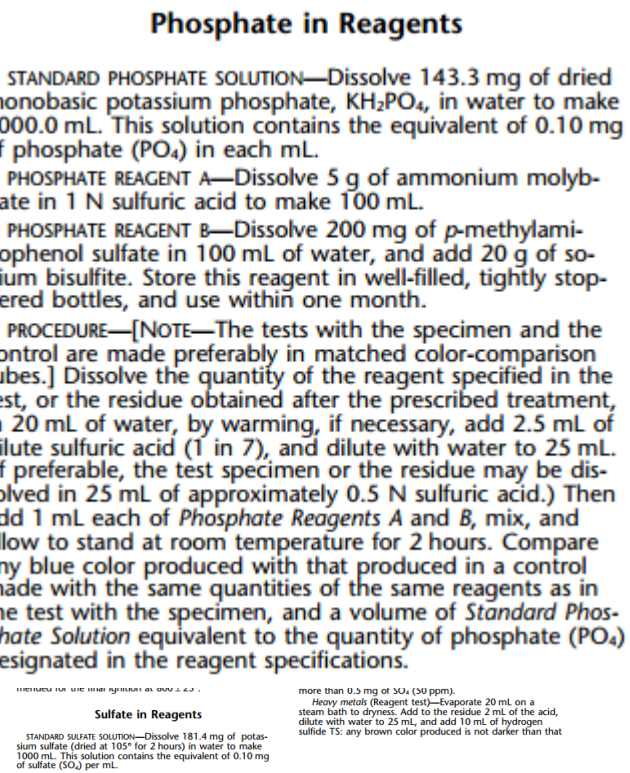
*Residue on evaporation*—Evaporate 50 mL on a steam bath, and dry the residue at 105° for 2 hours: the residue weighs not more than 1 mg (0.002%).

*Chloride* ⟨Reagent test⟩—Five mL shows not more than 0.01 mg of Cl (2 ppm).

*Sulfate* ⟨Reagent test, *Method I*⟩—Ten mL shows not more than 0.5 mg of $SO_4$ (50 ppm).

*Heavy metals* ⟨Reagent test⟩—Evaporate 20 mL on a steam bath to dryness. Add to the residue 2 mL of the acid, dilute with water to 25 mL, and add 10 mL of hydrogen sulfide TS: any brown color produced is not darker than that

# USP <36> Reagents, Indicators, and Solutions



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*Heavy metals* (Reagent test)—Evaporate 20 mL on a steam bath to dryness. Add to the residue 2 mL of the acid, dilute with water to 25 mL, and add 10 mL of hydrogen sulfide TS: any brown color produced is not darker than that

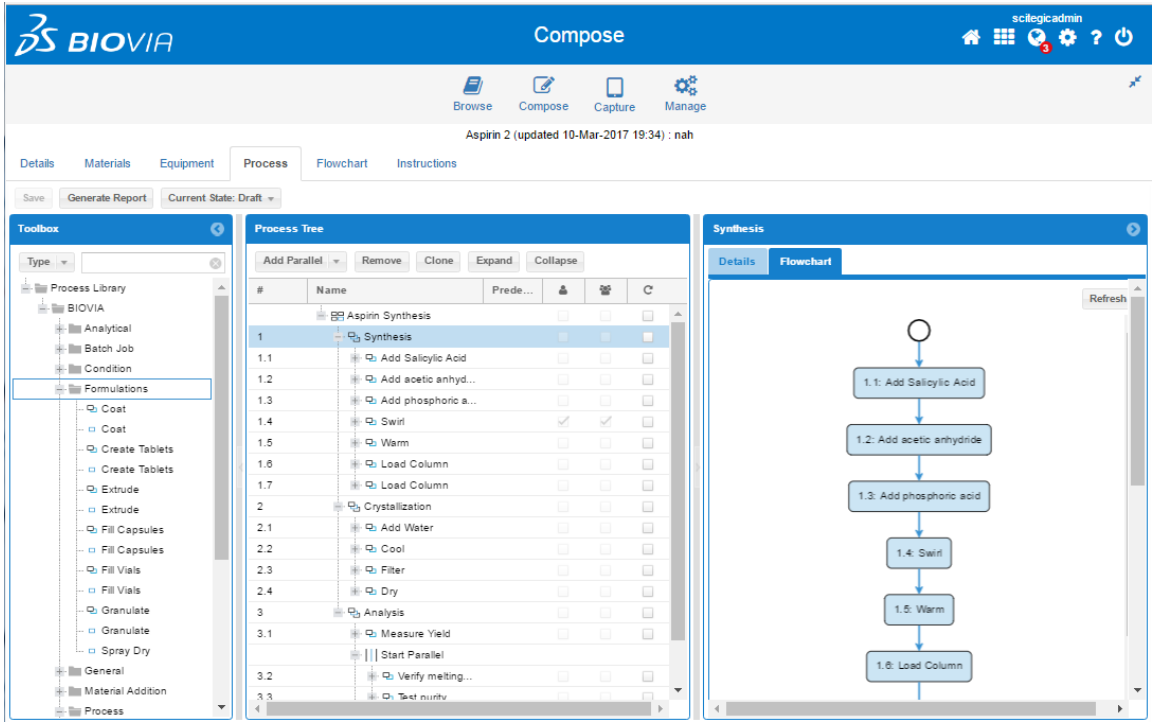
| Equipment | Process |
|---|---|
| Glassware | Dissolve |
| Balance | Weigh |
| pH Meter | Adjust pH |
| Photometer | |

| Materials | Parameters |
|---|---|
| Monobasic Potassium Phosphate | Concentration |
| Ammonium Molybdate | Amount |
| 1 N Sulfuric Acid | pH |
| P-methylaminophenol Sulfate | Temperature |
| Sodium bisulfite | |
| Water | |

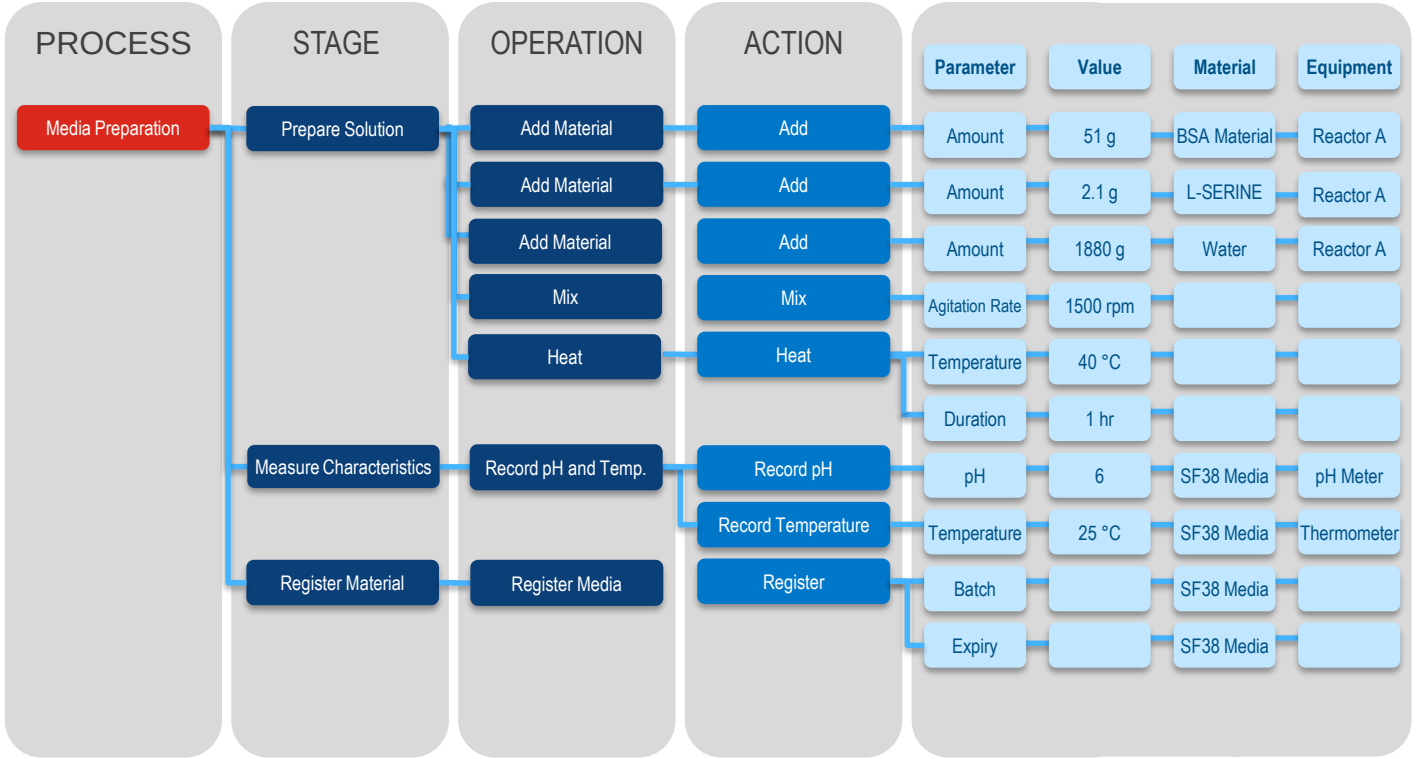
# The S88 Recipe Structure

## S88 Process Model

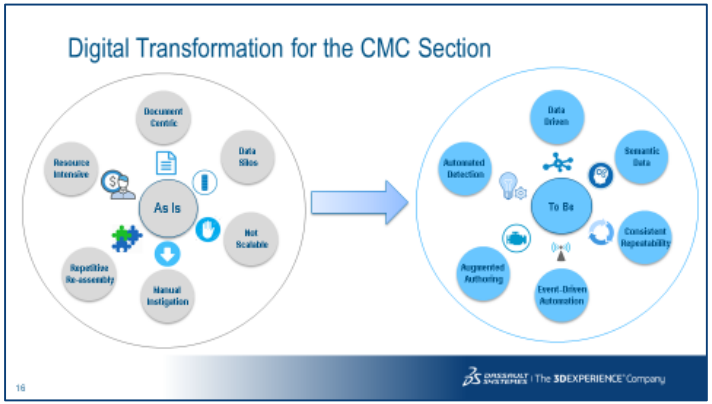
- Process
- Stage
- Operation
- Action
- Parameter

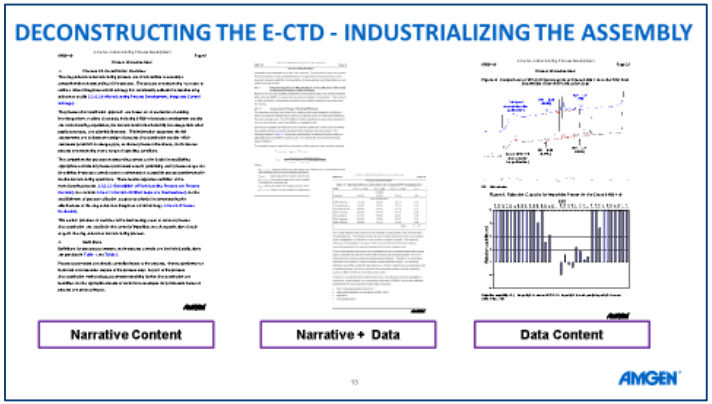


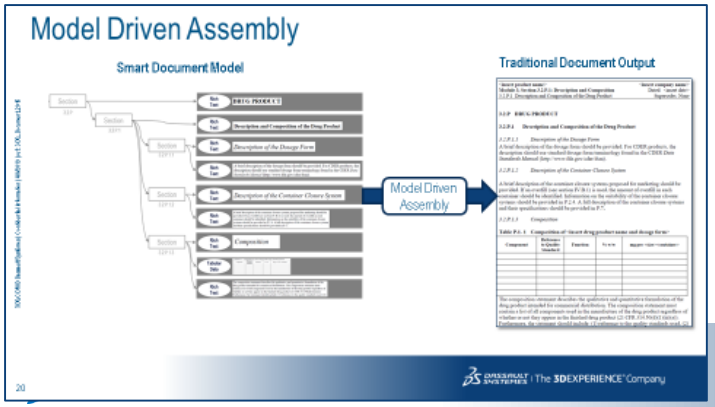
# Media Preparation – The S88 Way



# CMC Authoring – Nov 2018 Review



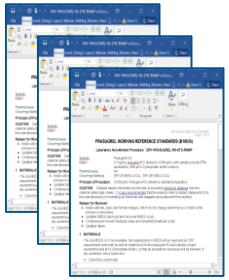



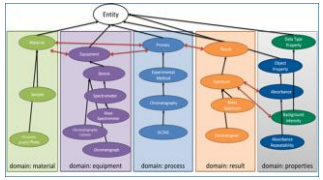

Demo Part I

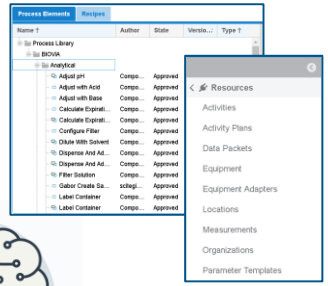
Generate figures for 32P22 template where formulation data are extracted for different temperatures and analysis

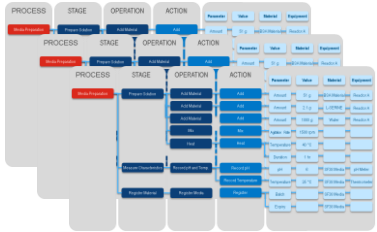
# Method Automation Process










| Digest Methods | Curate Best Practices | Load Libraries | Assemble Methods | Curate & Validate Methods |
|---|---|---|---|---|
| • Parameters<br>• Unit operations<br>• Equipment<br>• Materials | • Parameters<br>• Unit operations<br>• Equipment<br>• Materials | • Parameters<br>• Unit operations<br>• Equipment | • Parameters<br>• Unit operations<br>• Equipment | • Parameters<br>• Unit operations<br>• Equipment |
| Automate | Semi-Automated | Automate | Automate | Semi-Automated |