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INDIGO ELN USER GUIDE

VERSION 1.2

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CONTENTS

1. INTRODUCTION

1.1. OVERVIEW

Indigo ELN, the Open-Source Chemistry Electronic Lab Notebook, was developed within Pfizer, Inc. and is widely used by Pfizer scientists.

Pfizer licensed the software code of Indigo ELN to EPAM Life Sciences (former GGA) in order to create and deliver an external, open source version of CeN Chemistry Electronic Lab Notebook (Pfizer's Open-Sourced ELN).

Pfizer granted a license to EPAM to:

- Install, use, modify, and create derivative works of CeN.
- Allow its open source community of users to use CeN and the versions originating from this open-source code.
- Distribute Indigo ELN to its users on a standalone basis and/or in conjunction with EPAM products and services.
- Support Indigo ELN and its derivative works.

Benefiting from the considerable investment by Pfizer in its internal chemistry ELN, Indigo ELN provides scientists with a proven way to create, store, retrieve, and share electronic records of chemistry and biology-related information in ways that meet all legal, regulatory, technical, and scientific requirements.

Indigo ELN allows scientists to prepare, plan, and analyze experiments, access relevant information, and develop new methods using prior experience, in Synthetic Chemistry, Analytical Chemistry, and Process Chemistry.

Through the use of Indigo ELN, you can upgrade your existing ELN with a proven and tested open-source platform, and you can do it at no charge.

We hope that you will consider the use of Indigo ELN as it combines the best of two worlds: an application developed and refined at the world's largest pharmaceutical company and tested by thousands of chemists there, and a price point that is not possible to beat.

An electronic laboratory notebook is a system to **create**, **store**, **retrieve**, and **share** electronic records in ways that meet all legal, regulatory, technical and scientific requirements, while maintaining the responsibility of scientist for care and maintenance of laboratory records.

This document describes the process of using Indigo ELN.

1.2. INDIGO ELN: CORE OPEN-SOURCE PACKAGE

The Indigo ELN core open-source package offers:

- Basic functionality of Indigo ELN without using any proprietary Pfizer services or commercial third-party products.
- Basic functionality and user interfaces to create, describe, and manage singleton experiments and concept records.
- Reaction rendering and chemical properties calculation based on EPAM's chemoinformatics engine Indigo®.
- Support of ISIS Draw for structure editing.

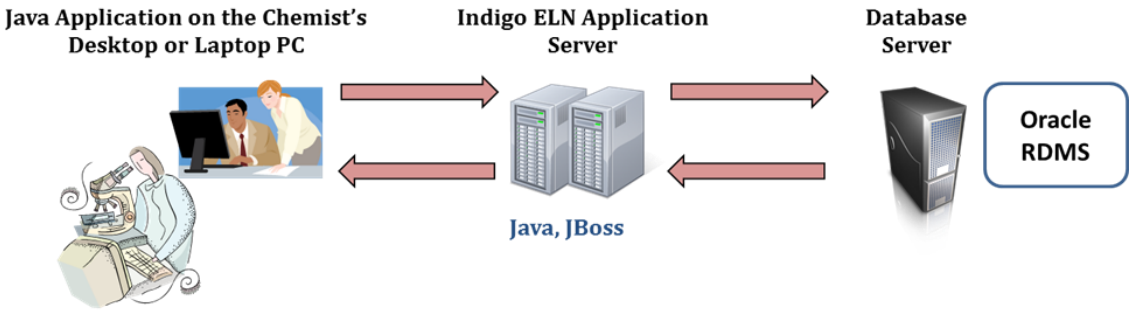
The package includes the following components:

- Simple User Management Tool.
- Simple Signature Service to Sign and Witness Experiments.
- APIs to integrate with existing customer services and databases.

EPAM can support customers in:

- Integration with their services and databases.
- Creation of new services.

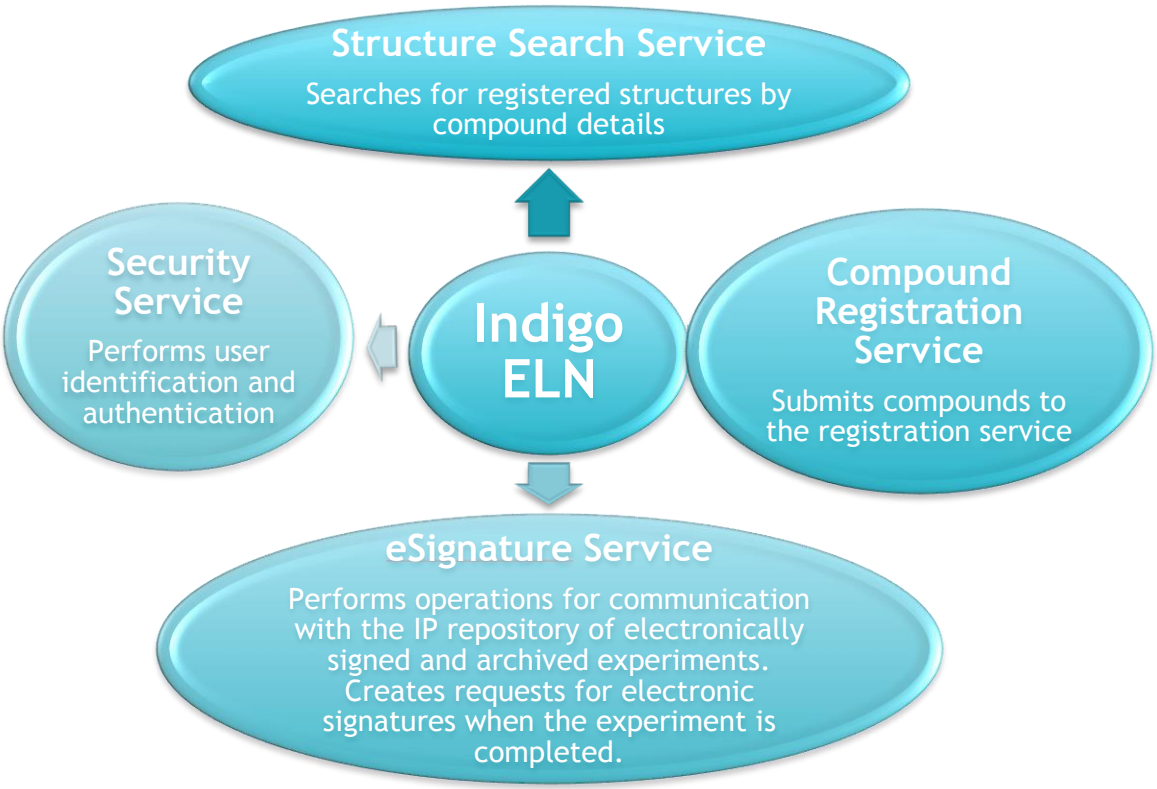
1.3. SYSTEM ARCHITECTURE AND TECHNOLOGIES



A 3-tier system with the desktop client distributed via web

- **Client Side Technologies:**
  - Swing
  - Java Web Start
- **Server Side Technologies:**
  - Spring Framework
  - Session EJB (Stateless and Stateful)
  - Message-driven beans
  - Oracle XML DB

1.4. INTEGRATION WITH EXTERNAL SERVICES



2. INDIGO ELN USER INTERFACE

2.1. FIRST START

To learn about installing and configuring Indigo ELN, please see the Indigo ELN Installation Guide. The following picture shows the start of Indigo ELN.

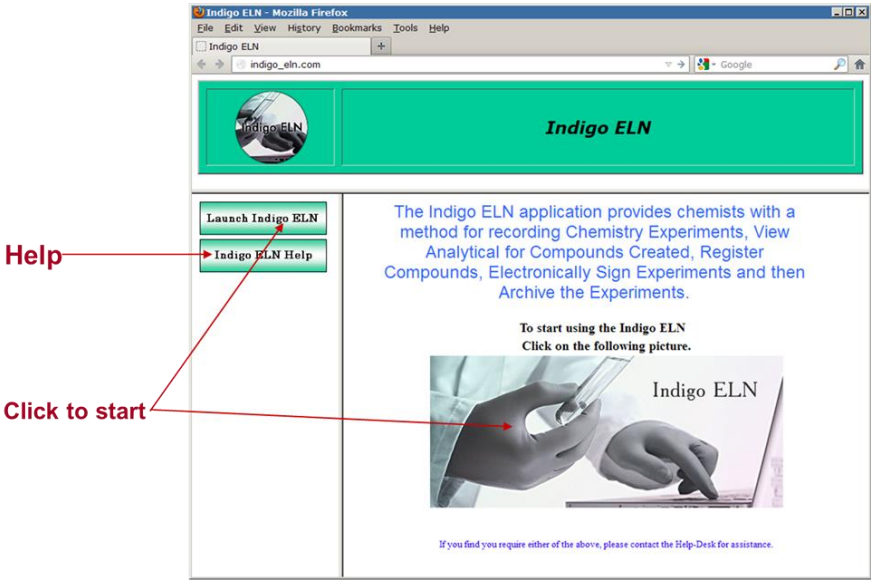


Figure 1. Starting Indigo ELN

2.2. LOGIN SCREEN

To log into Indigo ELN, on the Login screen, type your username and password, and then click ***OK***.

Figure 2. Login screen

2.3. MAIN WINDOW

The main window of Indigo ELN includes the following parts:

- *Navigation Pane* – Displays notebooks arranged by sites and users and experiments grouped within Notebooks.
- *Work Area* - Displays various tabbed views for working with the program.

The window includes the following standard elements:

- *Title Bar* identifies the owner.
- *Menu Bar* accumulates menu commands.
- *Toolbar* displays menu commands as icons.
- *Status Bar* displays the progress bar, date, and memory used.

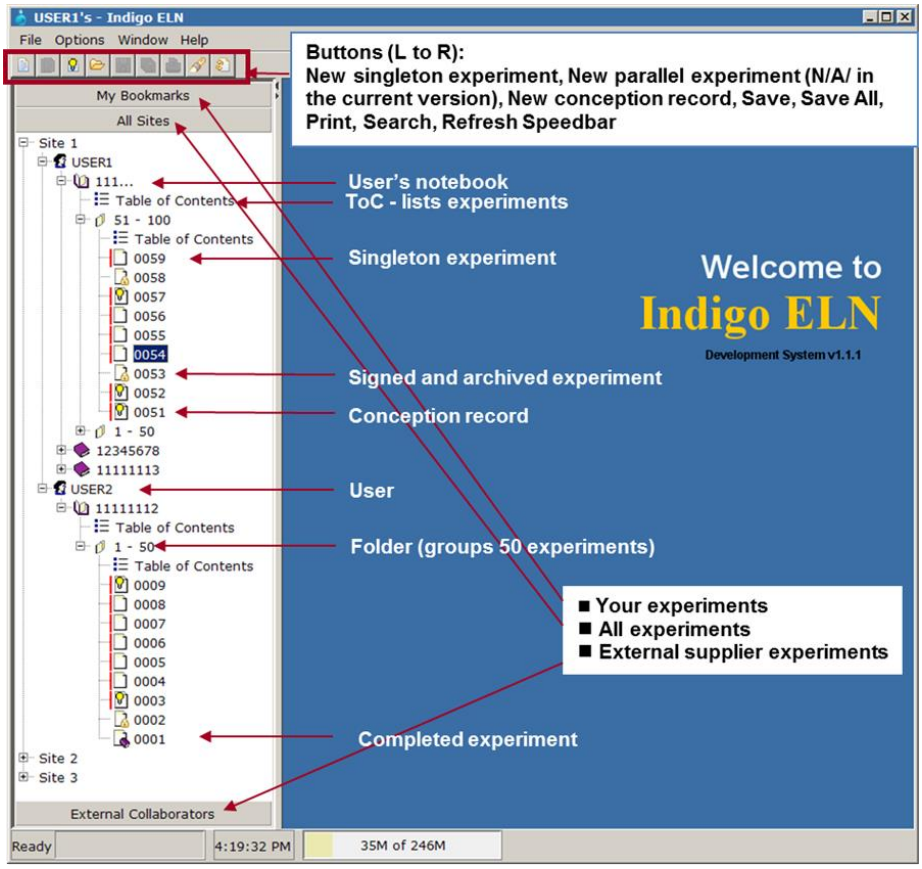


Figure 3. Indigo ELN main window

2.4. MENU COMMANDS

2.4.1. Standard Commands

Window menu

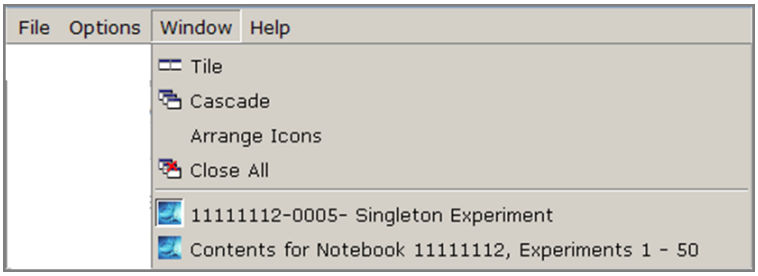


Figure 4. Window menu

Help menu

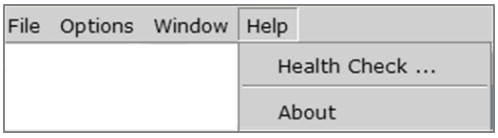


Figure 5. Help menu

For information about using the Health Check function, see Section 2.6.

2.4.2. Indigo ELN Specific Commands

File menu

The ***File*** menu includes commands to manage experiments:

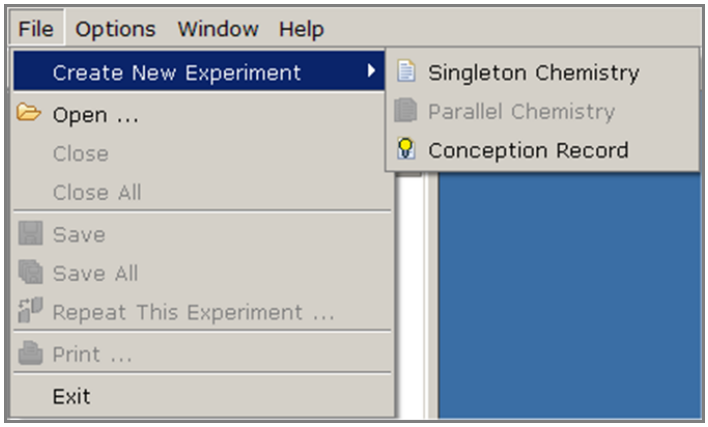


Figure 6. File menu

Options menu

The ***Options*** menu includes commands to set various program preferences and run search and signature routines:

Figure 7. Options menu

For information about using the ***Preferences*** command, see Section 2.5.

2.5. PREFERENCES

Clicking ***Preferences*** on the ***Options*** menu opens the ***Preferences*** dialog box providing some settings for the program. Users can set up the following types of preferences:

- Login setup, see Section 2.5.1.
- Structure databases, see Section 2.5.2.
- Therapeutic area and project codes, see Section 2.5.3.

2.5.1. Log-in Setup Preferences

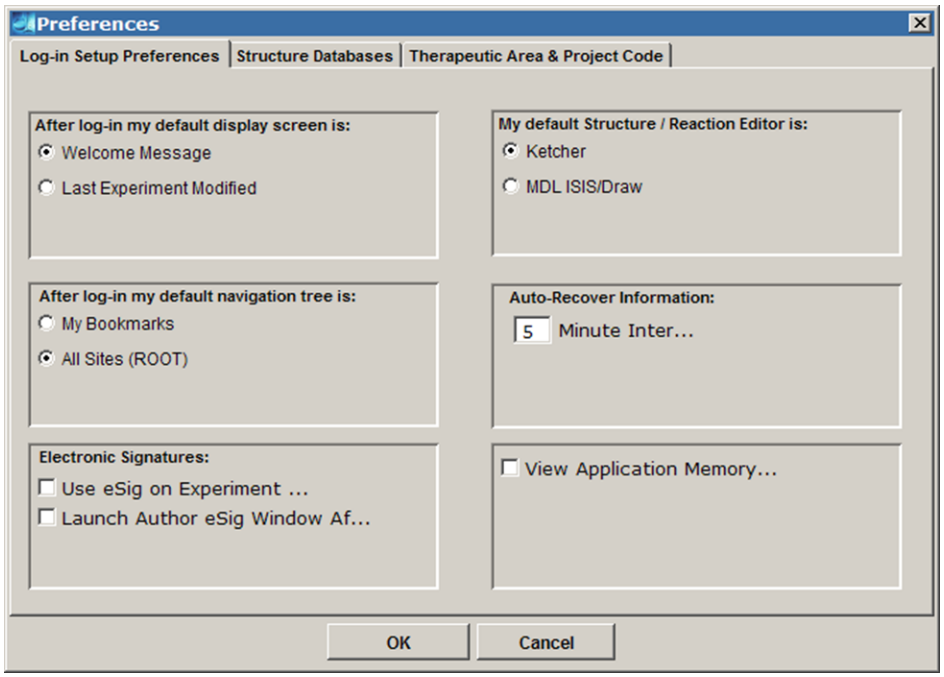


Figure 8. Log-in Setup Preferences tab

2.5.2. Structure Databases

This option is disabled in the current version since the software operates with a single structure database.

2.5.3. Therapeutic Area and Project Code

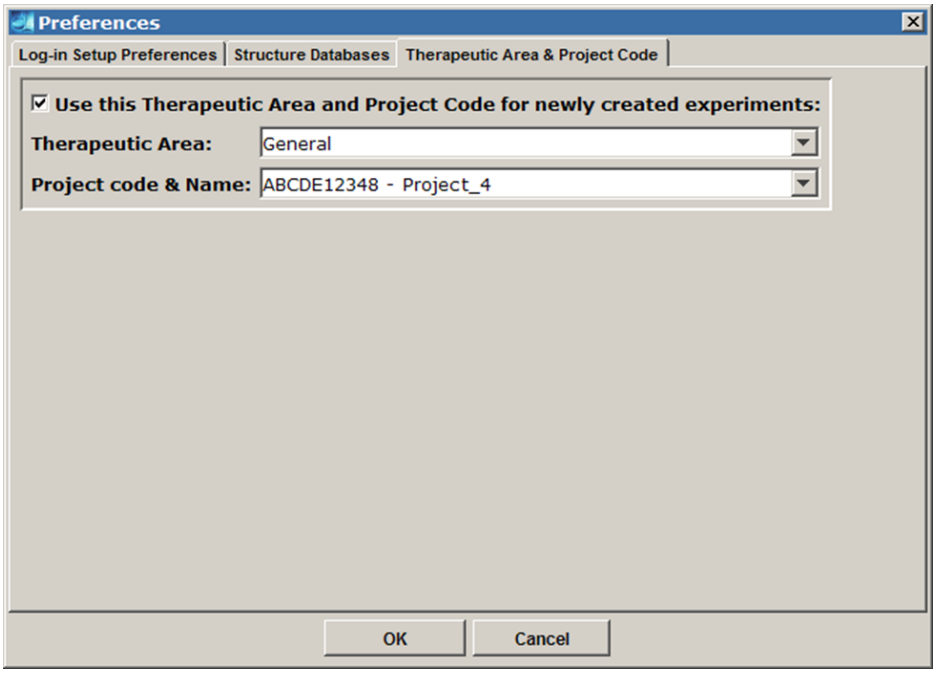


Figure 9. Therapeutic Area & Project Code tab

2.6. HEALTH CHECK SUMMARY

Clicking ***Health Check*** on the ***Help*** menu opens the ***System Health Check Dialog*** window displaying operability of the system components:

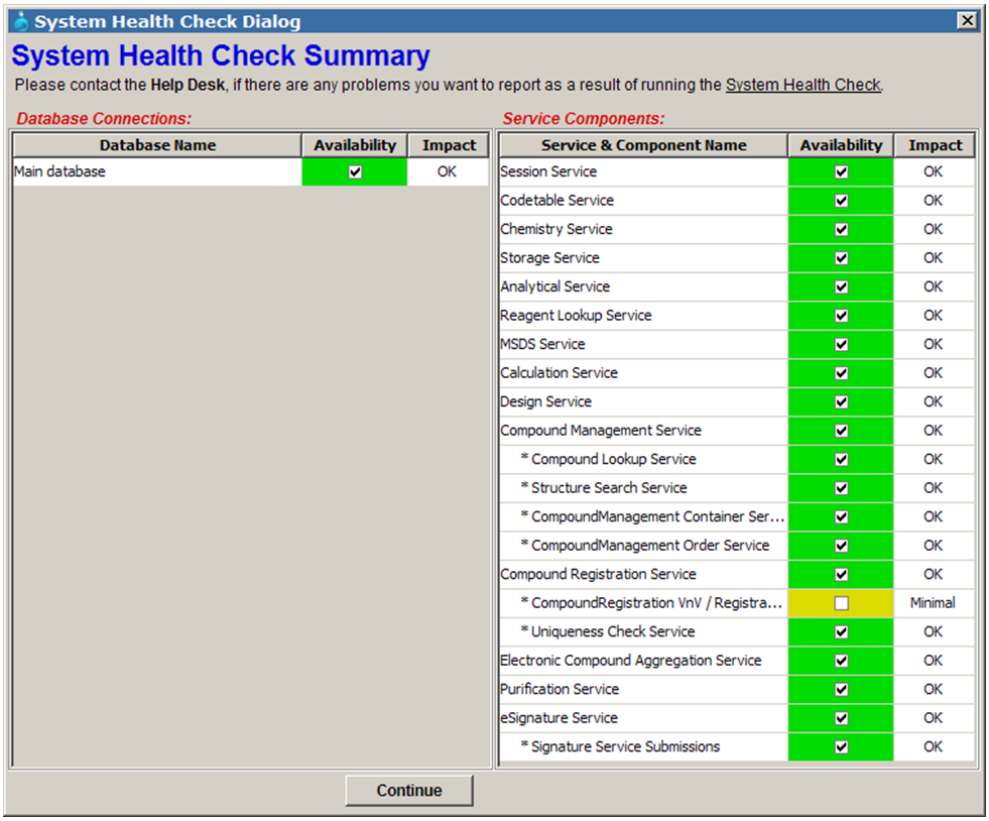


Figure 10. System Health Check window

3. INDIGO ELN FUNCTIONALITY OVERVIEW

3.1. MAJOR FUNCTIONS

- The major functions of Indigo ELN are the following:Browse experiments
- Create and set up a Singleton Experiment and Concept Record page
- Set up the run Experiment & Record Results
- Upload analytical information*
- Retrieve analytical information*
- Register and submit batches automatically
- Sign and witness Experiment*
- Attach documents
- Print report and offline access
- Search in Indigo ELN

* Functionality that works only after integration with the corresponding services.

3.2. BROWSING EXPERIMENTS

Selecting an experiment in the left pane of the Main window opens the experiment data in the Experiments tab of the Work area of the window.

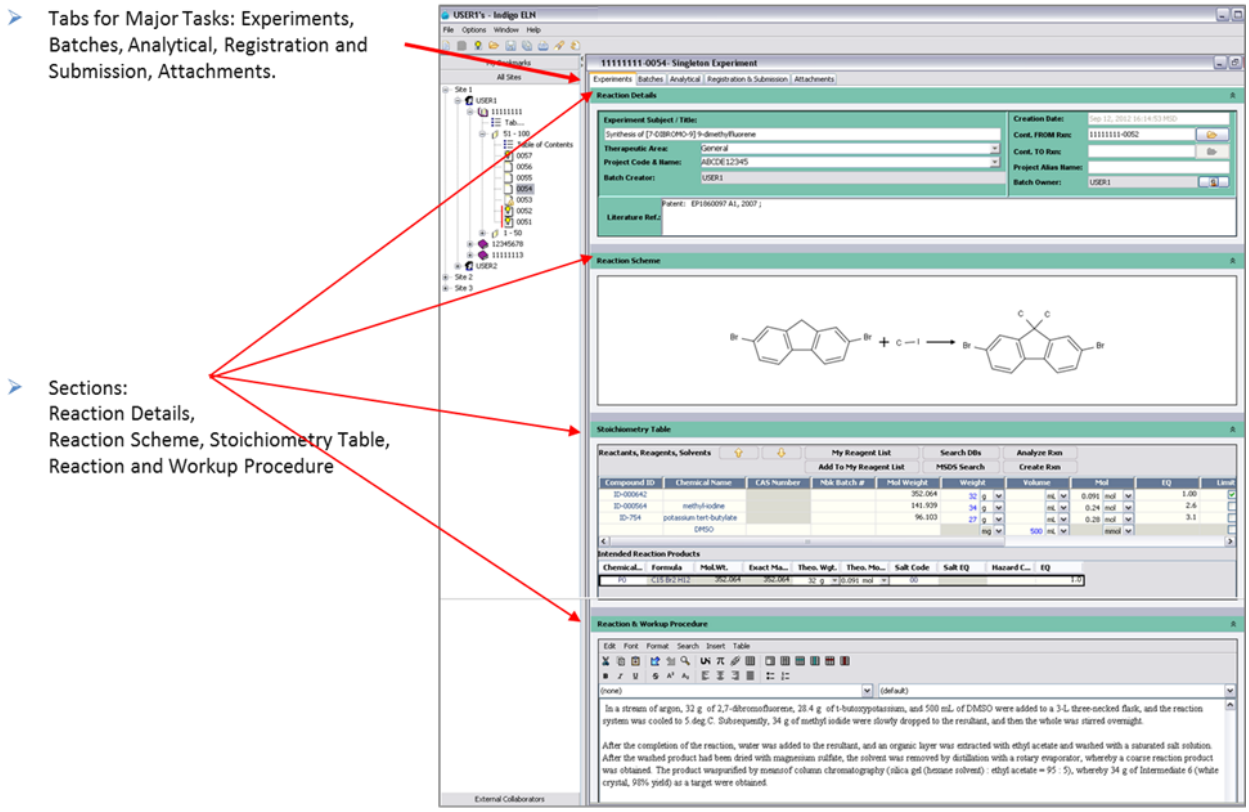


Figure 11. Experiment tab in the Work area

Users can collapse/expand/close the experiment using standard Windows controls.

> ***Note***
> *Users can open more than one experiment at a time, but try to avoid having too many open as it slows performance and could potentially exceed your computer's available memory.*

Tabs provide sections to enter data for the major tasks: experimental setup data, product batches data, analytical results, registration and submission of products, and attached documents.

Within each tab, sections divided by title bars subdivide the data. Click anywhere on a title bar to expand/collapse that section.

The following are the tabs to manage experiments in the Work area:

- Experiment – allows users to describe general information of experiment, set Reaction schema, execute Stoichiometry calculations with reactant, Reagent, and Solvents. See Figure 11
- Batches - allows users to define synthesized products, document their yields, purity, and other properties. See Figure 12.

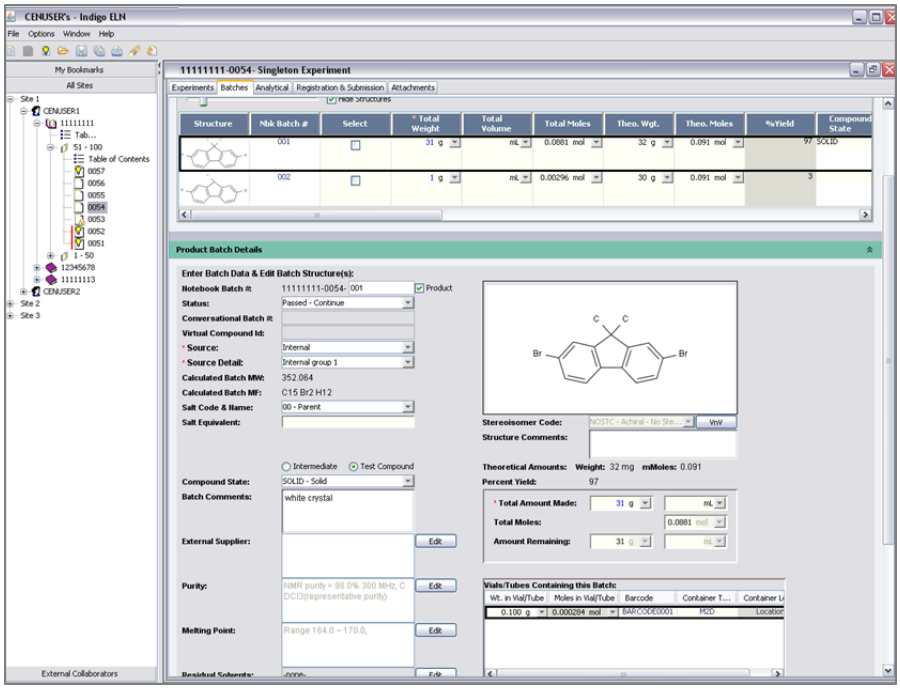


Figure 12. Batches tab

- Analytical - allows users to upload PDF documents with analytical results or retrieve such information from external databases using NMB batch number as a reference.

Note

Integration with external analytical services is not implemented in the current version).

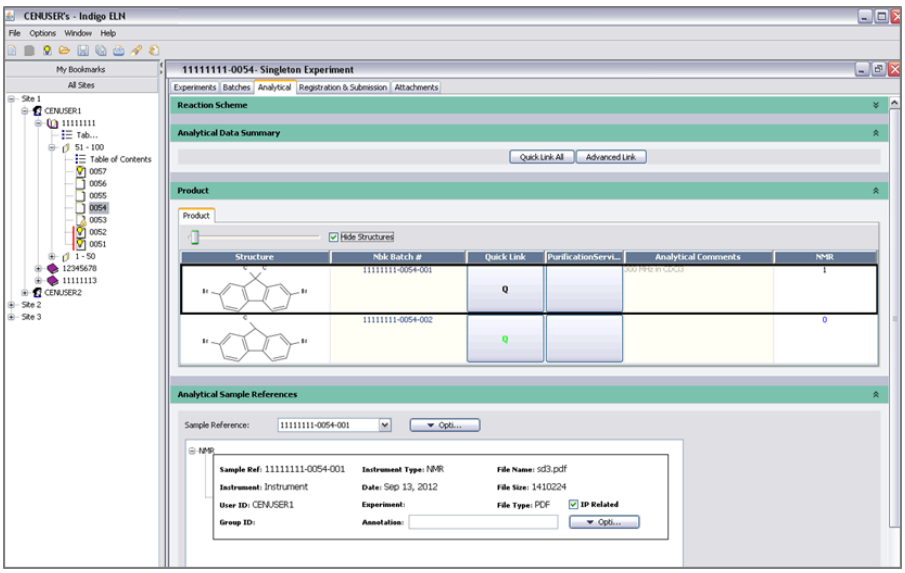


Figure 13. Analytical tab

- Registration and Submission - allows users to send batches to the registration service and receive registration status as assigned Conversational batch number, review batch details provided on the Batch Tab, and create a CD file.

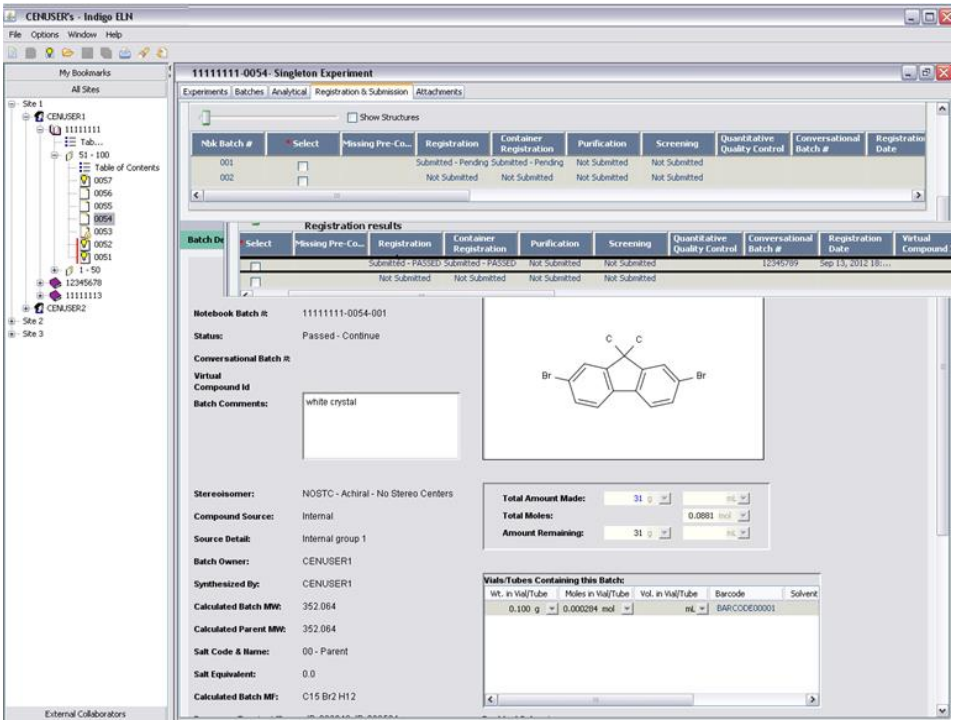


Figure 14. Registration & Submission tab

- Attachments – allows uploading documents as attachments to an experiment using ***Options -> Add New Document***.

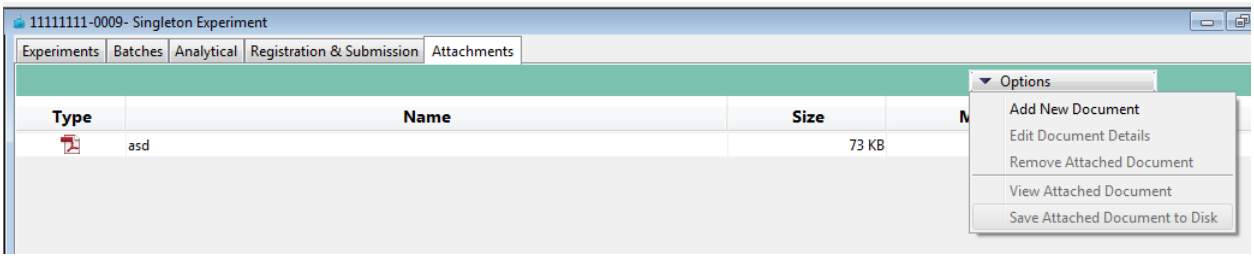


Figure 15. Adding documents on the Attachments tab

3.2.1. Managing Reagent Lists

On the Experiments tab, users can create a personal list of reagents. To add a reagent to My Reagent list, users should right-click anywhere in the Stoichiometry Table section and then click ***Add To My Reagent List*** on the pop-up menu. To see the list, users need to click the ***My Reagent List*** tab:

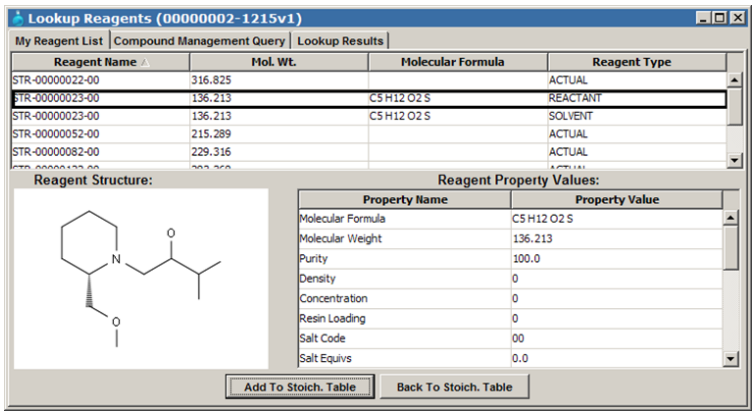


Figure 16. My Reagents List

3.3. CREATING SINGLETON EXPERIMENTS

There are three ways to create a new experiment:

- Create a new blank experiment, see Section 3.3.1.
- Repeat an existing experiment, in which case only the information on the Experiment tab is copied, see Section 3.3.2.
- Create a new version of an existing experiment, in which case all information from all the tabs is copied, see Section 3.3.3.

3.3.1. Setting up a New Singleton Experiment

To create a new blank experiment:

1. In the navigation pane, right-click the node where you want to place the experiment and click ***Create New Experiment > Singleton Chemistry*** on the pop-up menu.

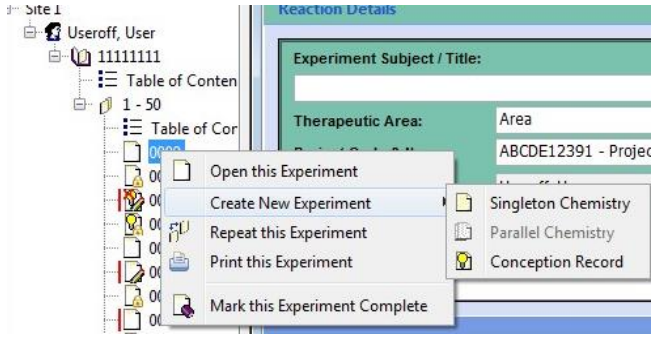


Figure 17. Creating a Singleton experiment

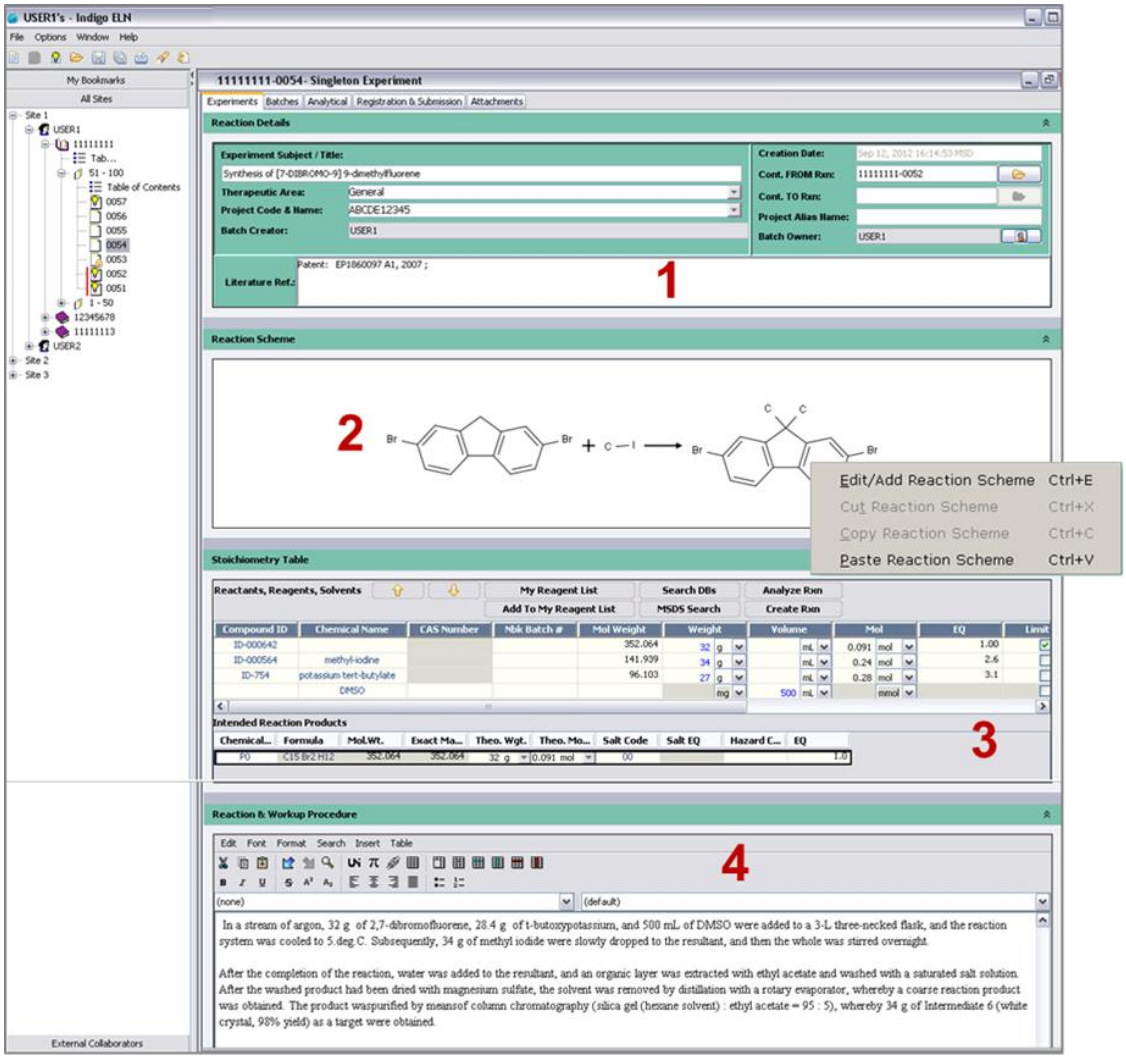


Figure 18. Creating a blank experiment

2. On the Experiments tab, in the Reaction Details section, provide a descriptive title and detailed information about the experiment.
3. Double-clicking the Reaction Scheme area invokes the structure drawing editor specified in the Preferences dialog. You can right-click this area to invoke the menu with more options.
4. Use the Stoichiometry Table to provide data about the reaction participants.
5. Use the Reaction and Workup Procedure section to describe the procedure of the experiment, insert tables, images, and other objects, as necessary.

Note

The text editor in the Reaction and Workup Procedure section provides standard text editing funcitons.

To use special editing functions of the program, right-click the text to display the menu:

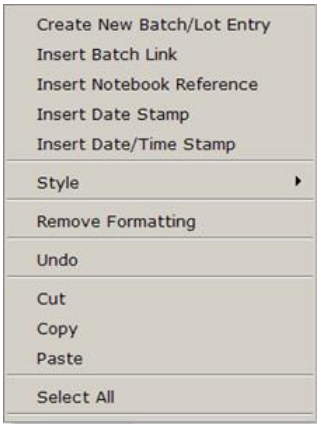


Figure 19. Text editing menu

The Reaction Scheme and Stoichiometry Table sections are related to each other and thus users can populate them using one of the two methods:

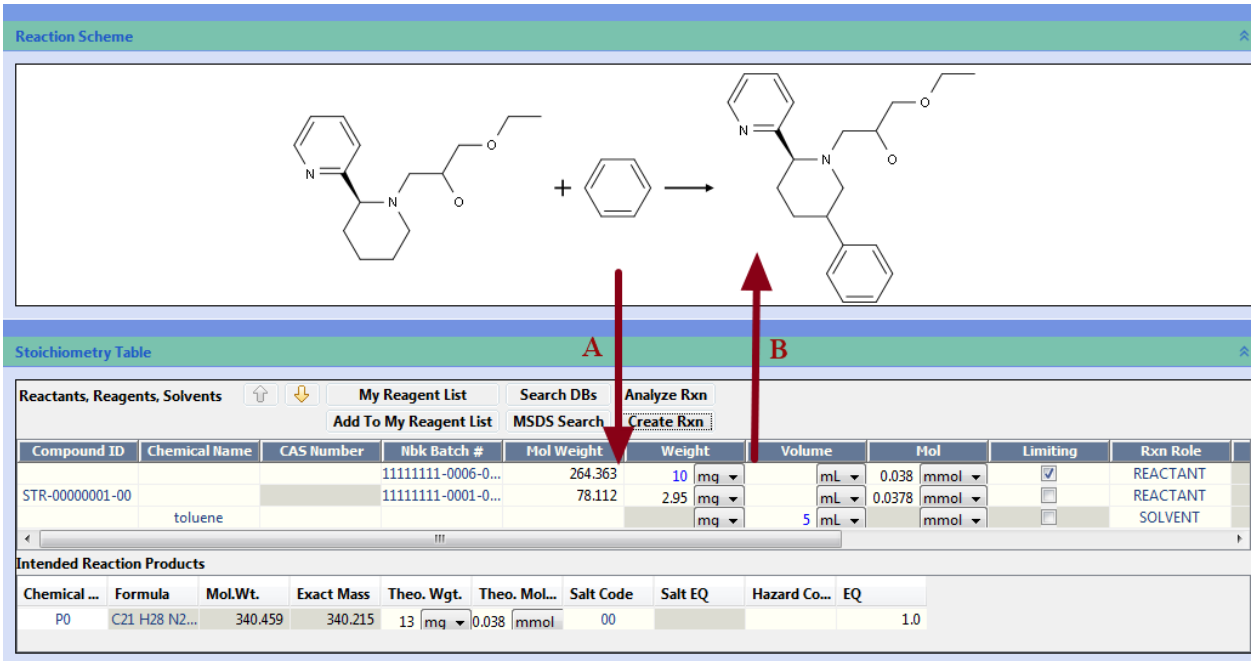


Figure 20. Methods of populating Stoichiometry Table and Reaction Scheme

Method A. **Reaction Scheme > Stoichiometry Table**

1. Draw the reaction scheme using a structure editor.

Note:

Users select the structure editor to use in the Preferences window, see Section 2.5.1.

2. In the Stoichiometry Table section, click ***Analyze Rxn*** to create the corresponding rows in the Stoichiometry Table.
3. Add other solvents and reagents to the Stoichiometry Table.

Method B. **Stoichiometry Table > Reaction Scheme**

1. Enter reactants, solvents, and reagents into the Stoichiometry Table.
2. In the Stoichiometry Table section, click ***Create Rxn*** to create reactant structures.
3. Edit the reaction scheme to add intended products.
4. In the Stoichiometry Table section, click ***Analyze Rxn*** to create a row for the intended products.

3.3.2. Repeating an Experiment

Users can repeat anyone's experiment by right-clicking the experiment, and then clicking ***Repeat this Experiment***. This creates in the user`s notebook an experiment with the next sequence number and a copy of the data on the Experiments tab only. The data from the Batches, Analytical, Registration, and Attachments tabs are not copied, because those results tend to be different from the original.

> ***Note***
> *Make sure to edit any data that are not relevant to the new experiment in every section of the experiment - reaction scheme, stoichiometry, procedure & workup. Pay particular attention to product batch links: the copy refers to the original experiment batches.*

3.3.3. Versioning an Experiment

Users can only make new versions of their own experiments. This is useful when users need to correct erroneous data or to add new data that was obtained after closing the original experiment (for example, analytical results). Initially, the new version has all the data of the original experiment.

Other users can only see the newest version, while the author can see all of the versions.

All versions must be completed and signed-off, leaving an IP record of all the work.

> ***Note***
> *Be sure to edit any data that are not relevant to the new experiment in every section of the experiment - reaction scheme, stoichiometry, procedure & workup. Pay particular attention to product batch links: the new version refers to the original experiment batches.*

3.4. PRINTING EXPERIMENTS TO PDF

Users can save the information about an experiment to a pdf file. To do this, right-click the experiment in the navigation pane and click ***Print this Experiment*** on the pop-up menu. The information is saved to a pdf file in **C:/Documents and Settings/<USERName>/.IndigoELN/Printing-TMP/<ExperimentID>/.**

3.5. RUNNING EXPERIMENT AND RECORDING RESULTS: BATCHES

When users have a product batch, users can create it either in the Reaction & Workup Procedure section of the Experiments tab or on the Batches tab.

3.5.1. Creating Batches on the Experiment Tab

The advantage of creating a batch on the Experiments tab is that users can create a batch while describing the experiment procedure thus explaining how it was made.

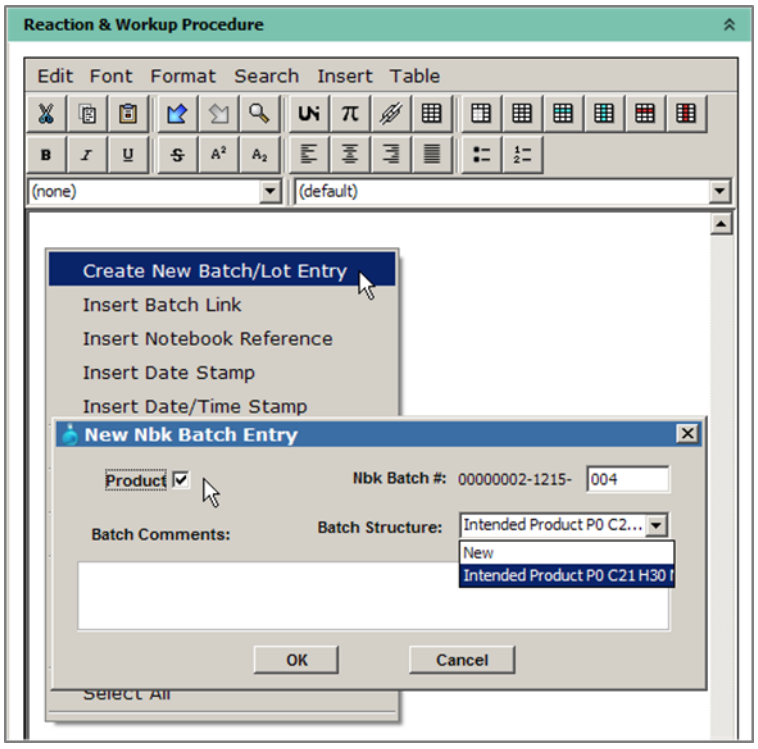


Figure 21. Creating batches on the Experiments tab

1. In the Reaction & Workup Procedure section, right-click inside the text area and click ***Create New Batch/Lot Entry*** on the pop-up menu.
2. In the New Nbk Batch Entry window, select the ***Product*** checkbox if the batch is the intended product. The program calculates %yield for these batches if the other stoichiometry calculations have been made. If this is the intended product structure, select the corresponding value in the ***Batch Structure*** drop-down list.

3.5.2. Creating Batches on the Batches Tab

There are three ways to create batches on the Batches tab:

- Synchronize with intended products by clicking the ***Sync with Intended Products*** button to create a batch for each intended product to the right of the reaction arrow.
- Add a new batch by clicking the ***Add New Batch*** button or ***Add Batch*** on the pop-up menu to create an empty batch, for which users draw the structure.
- Duplicate an existing batch by clicking ***Duplicate Batch*** on the pop-up menu.

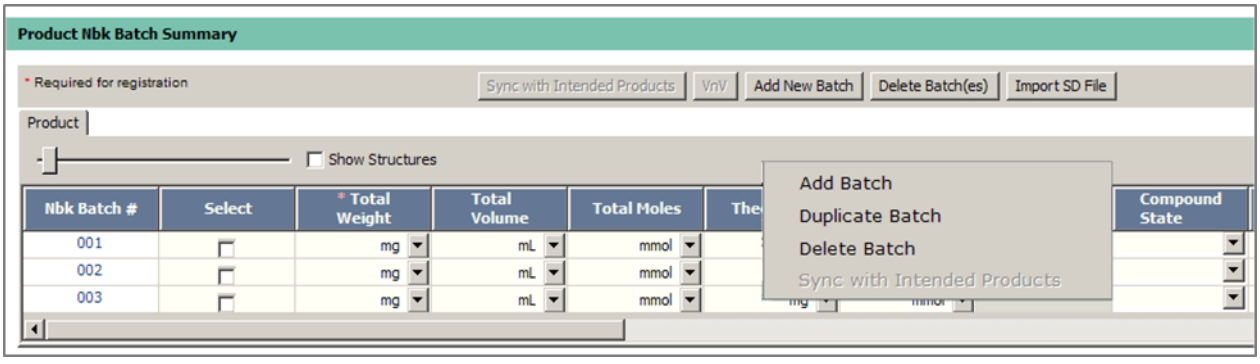


Figure 22. Batches menu

Users can also edit information in the Product Batch Details section as well as in the Product Nbk Batch Summary table that auto-synchronizes with the Details section:

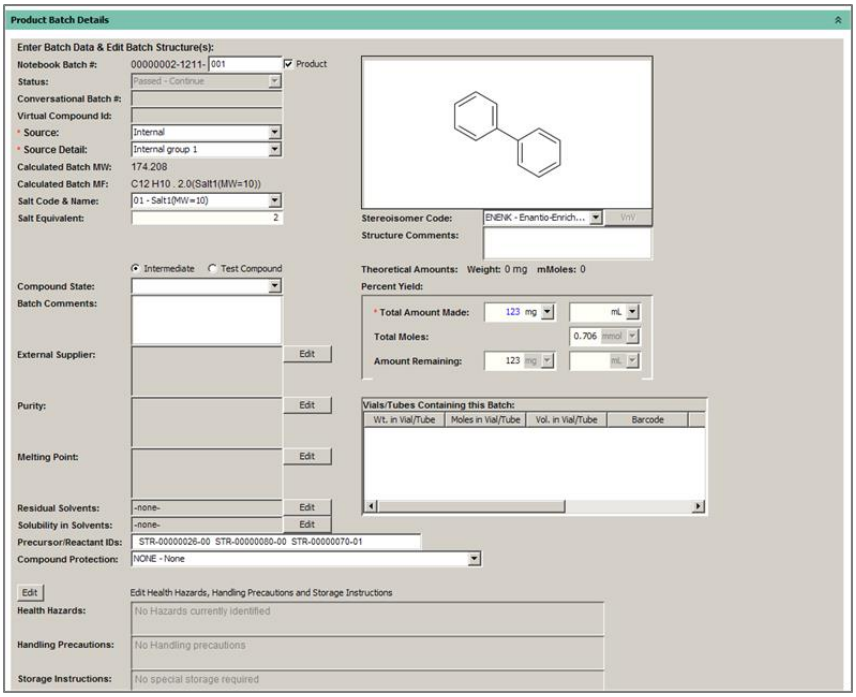


Figure 23. Product Batch area

3.6. REGISTERING AND SUBMITTING COMPOUNDS

The program integrates with the registration and submission services.

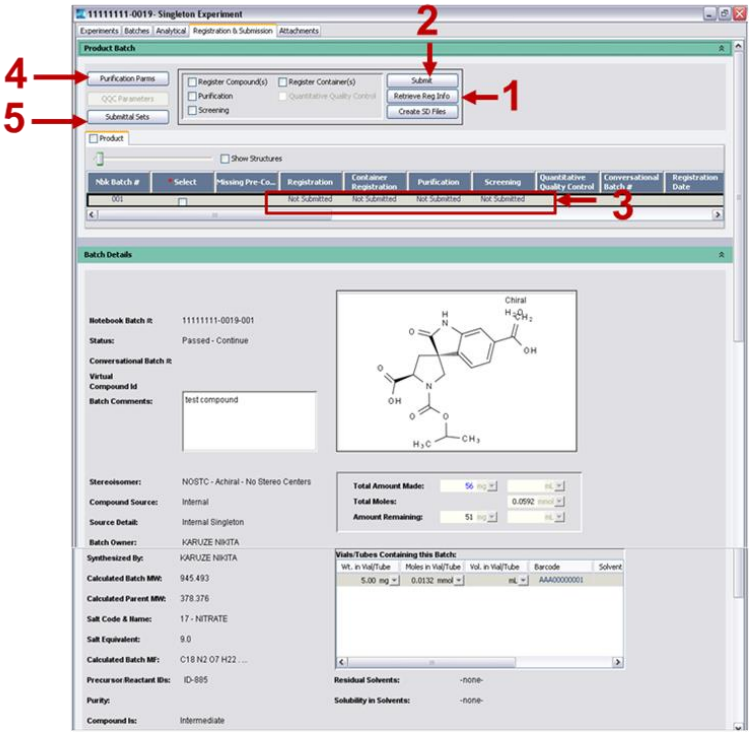


Figure 24. Registration features

Users can:

1. Retrieve registration information for batches in the table;
2. Submit all batches for registration at the same time;
3. Browse the status of batches registration (unique batch # is assigned to the compound);
4. Provide Purification Parameters to the Purification service;
5. Select Submittal sets.

3.7. CREATING CONCEPTION RECORD PAGES

Users can create a Conception Record page on the basis of:

- A structure or reaction added by users in normal and generic format.
- Design Synthesis Plan.

To create a Conception record, right-click a folder and click ***Create New Experiment > Conception Record***. The Work area displays three tabs: Concept, Preferred Compounds, and Attachments.

The Concept tab provides the following functionality:

- To identify ***Designers***, click the People ( ) button next to the Designers section.
- The Reaction Concept/Generic Target section can be used for either a reaction idea or an idea for a generic structure, whichever is the invention.

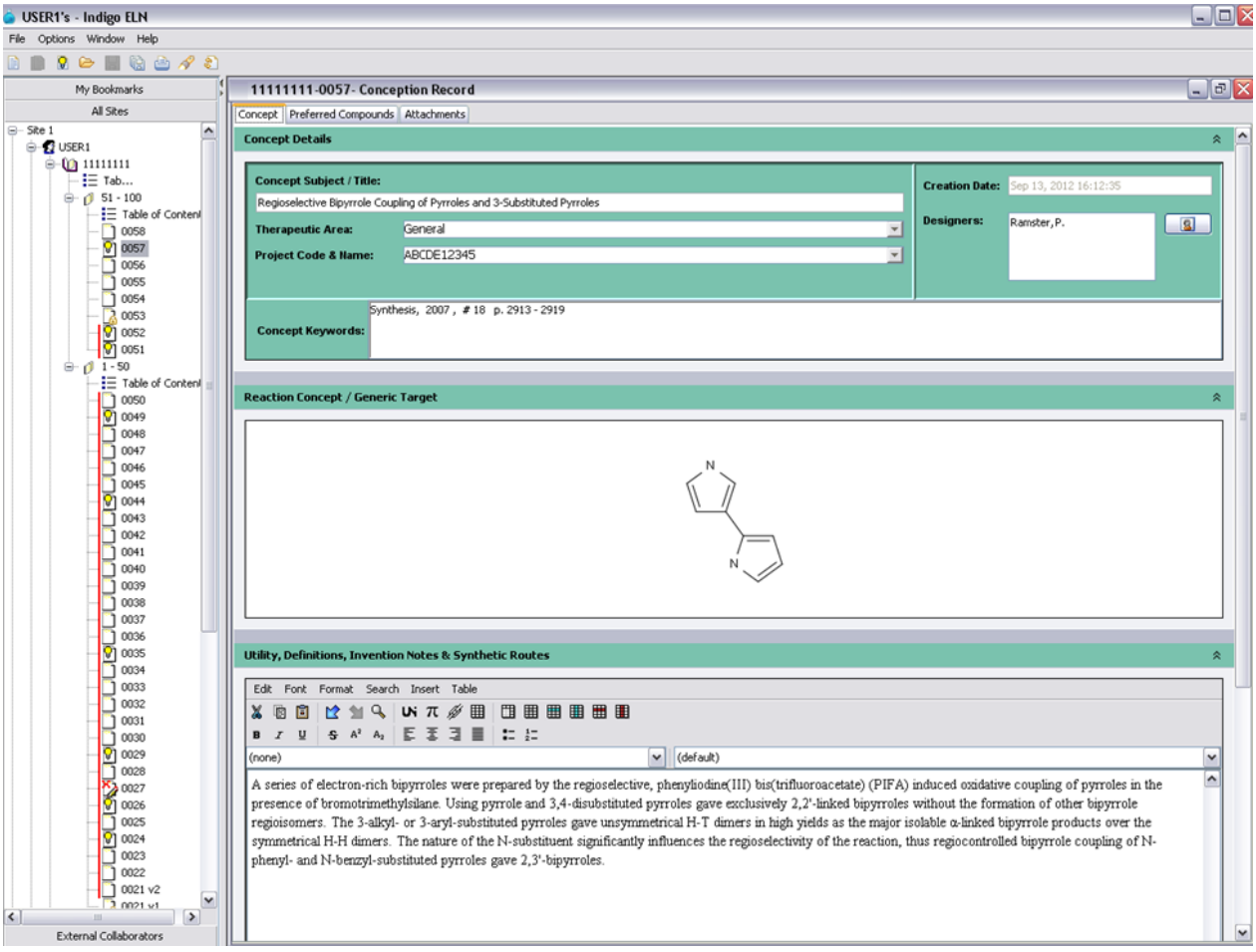


Figure 25. Concept tab

On the Preferred Compounds tab, users can add compounds as specific examples of the generic structure.

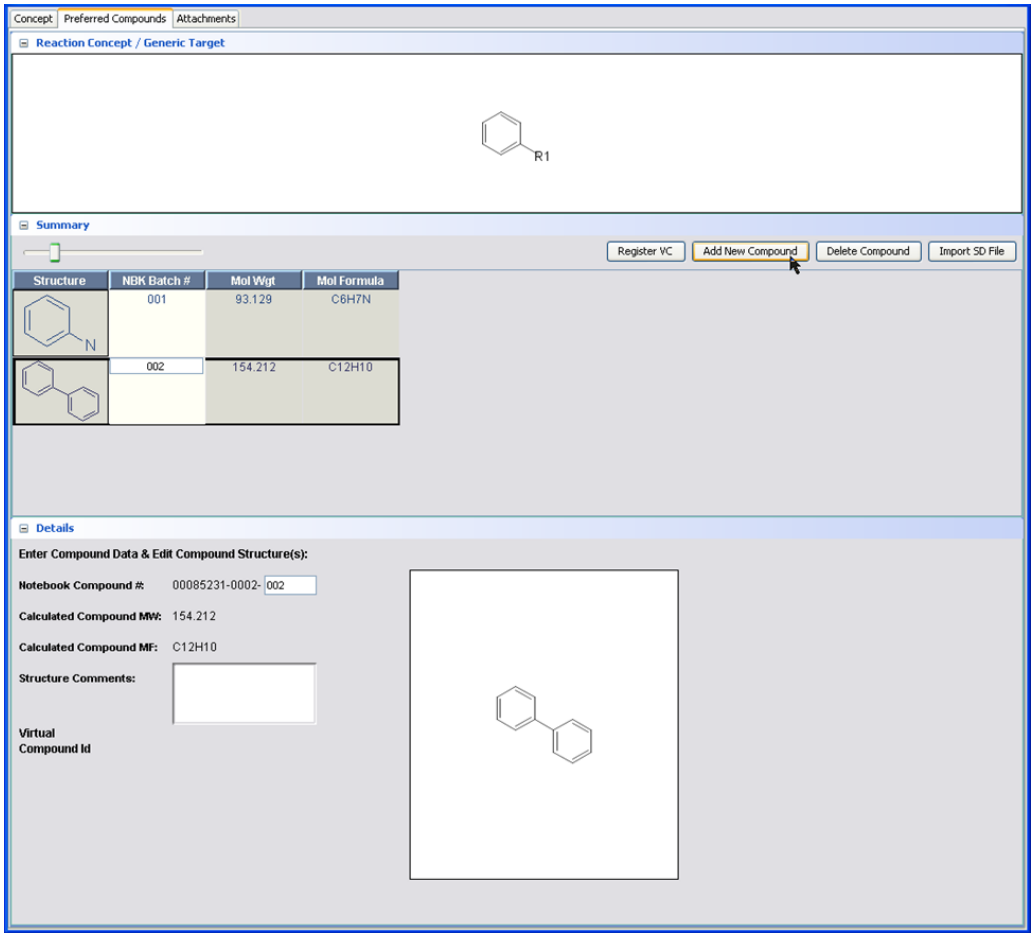


Figure 26. Preferred Compounds tab

On the Attachments tab, to add or edit attached documents, users click ***Options*** and select the required item on the pop-up menu.

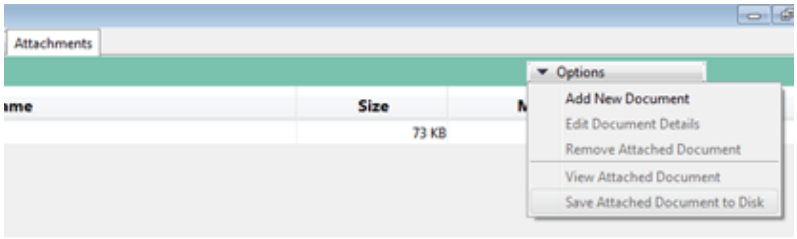


Figure 27. Adding an attachment to a Conception Record

3.8. INDIGO ELN SEARCH

There are four ways of searching structures in Indigo ELN:

- Search from the Experiments tab;
- Search using ***Options*** > ***Search***;
- Search for reactions using the Analyze Rxn feature;
- Search in the fields of the Stoichiometry Table.

3.8.1. Search in the Database

On the Experiments tab, click ***Search DBs*** to invoke the Lookup Reagents window:

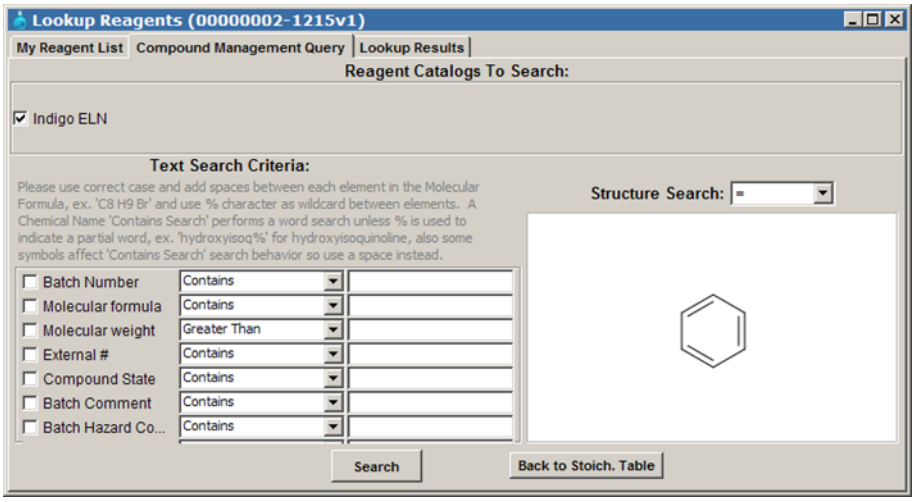


Figure 28. Lookup reagents window

In fact, it is the second tab of the Lookup Reagents dialog. This dialog specifies search parameters. Users must select the ***Indigo ELN*** checkbox to display search options. Users can also double-click inside the rectangle in the lower-right corner to invoke the structure editor and draw a structure for Structure/Substructure/Similarity search.

All text fields invoke search in the inner database of Indigo ELN. The structure field sends the query to the Search Service and retrieves Compound ID to search in the inner database of Indigo ELN. In case both structures and text fields are entered, first, the Search Service returns all Compound IDs, and then performs the search by text fields in the Indigo ELN database.

To see the search results, click ***Search***. The results appear in the third tab of the window:

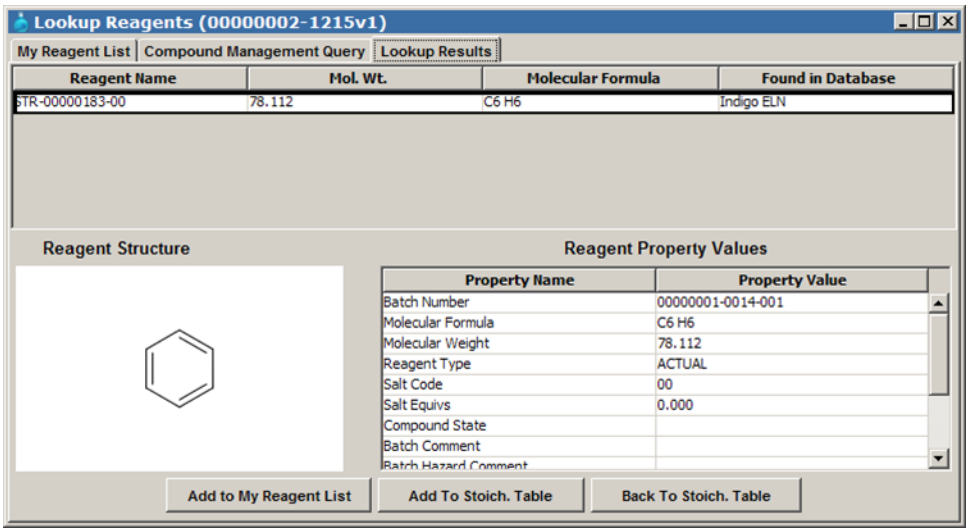


Figure 29. Display of search results

Note

Drawing a structure enables the search only among registered batches.

3.8.2. Search for Experiments

You can search for experiments according to specified criteria. The search looks for experiments in the inner Indigo ELN database that includes a given compound or reaction together with selected text parameters.

To search for experiments, click ***Options>Search*** to invoke the Query & Search dialog box, specify the search options, and click ***Search*** to display the Search Results window.

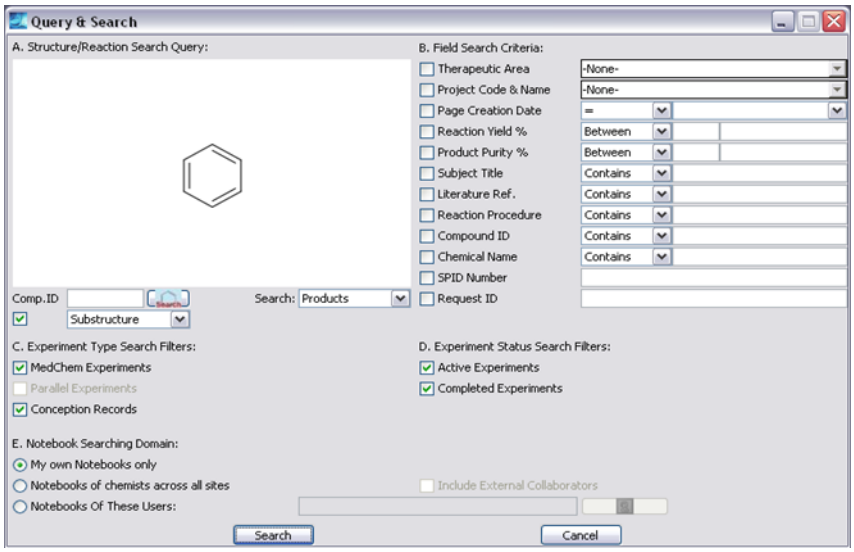


Figure 30. Query & Search dialog box

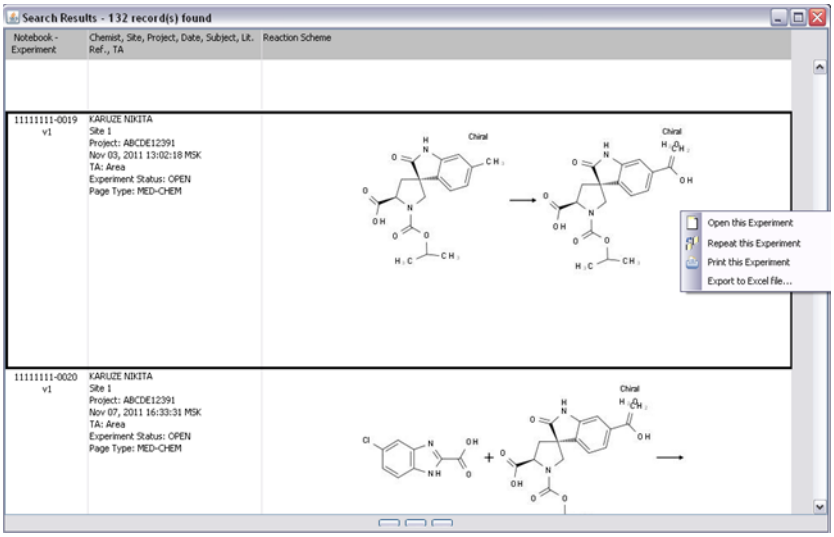


Figure 31. Search Results window

3.8.3. Search for Reactions

The Analyze Rxn feature searches for reactions in the Search Service by the structure of components. See Section 3.3.1 for details.

3.8.4. Search in the Fields of the Stoichiometry Table

Users can use the following fields of the Stoichiometry Table to search by typing the search options.

Searching in the Search Service:

- ***Compound ID***
- ***CAS Number***

Searching in Indigo ELN inner database:

- ***Nbk Batch #***

To start the search, click inside the field and type the required value.

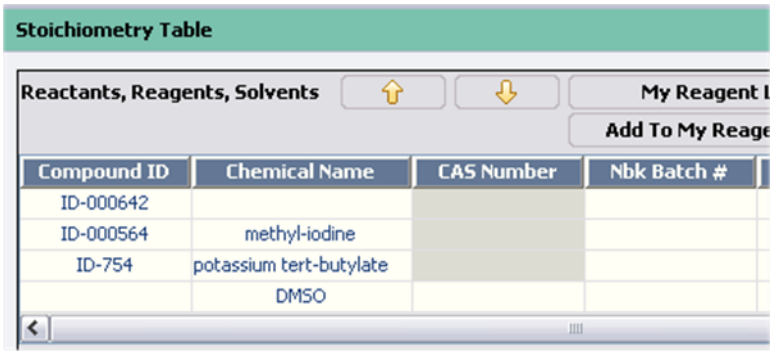


Figure 32.Searching in fields of Stoichiometry table

3.9. SIGNING EXPERIMENTS

EPAM ships Indigo ELN together with the eSignature service that provides tools to submit, sign, and archive experiments. To use the Signature Service:

1. Complete the experiment by right-clicking the experiment and selecting ***Mark this Experiment Complete***.

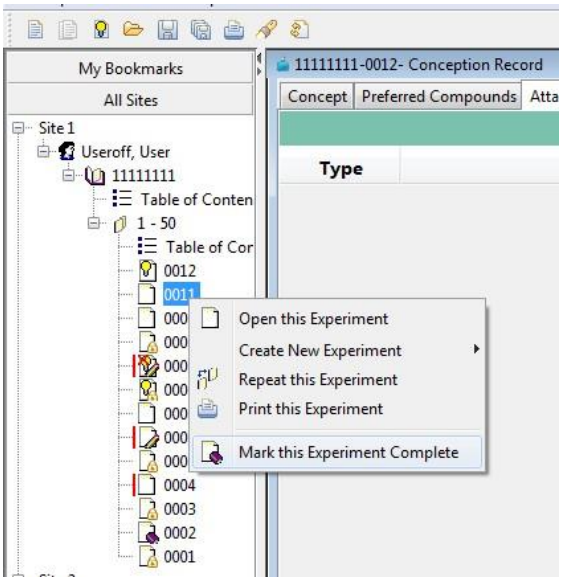


Figure 33. Completing an experiment

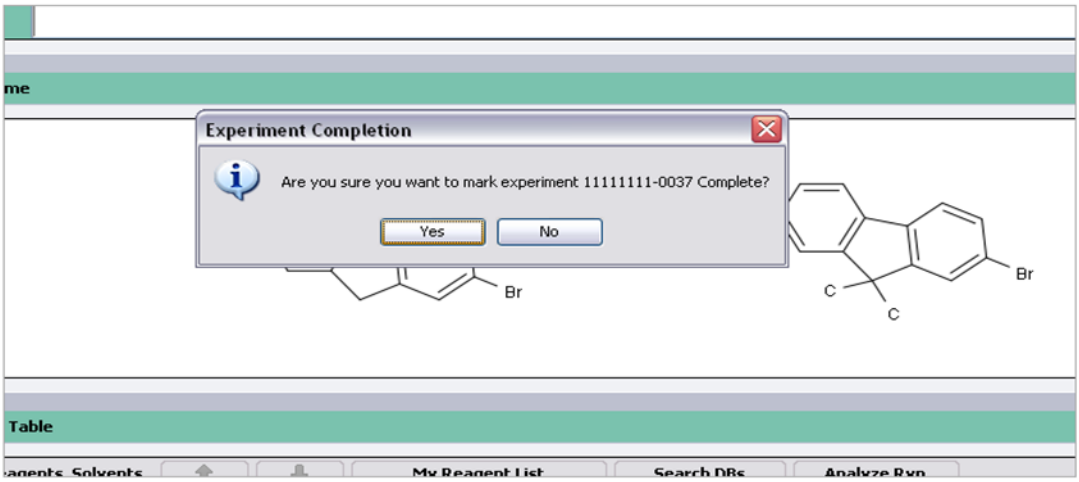


Figure 34. Signing experiments

2. Select the template and submit the experiment for signature.

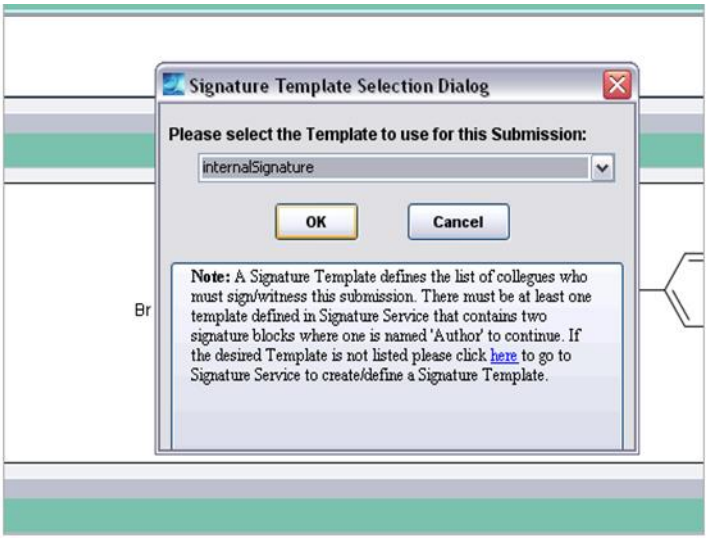


Figure 35. Selecting a template for signature

3. Click ***OK***.
4. Further actions happen inside the Indigo Signature Service application. Follow the steps described in the Indigo Signature Service User Guide.

Note

Other signers in the queue sign or reject an experiment via the Indigo Signature Service UI.

Information about the experiment updates while it is undergoing the signing procedure. Users can see the status of the experiment when users point the cursor at the experiment in the Navigation pane:

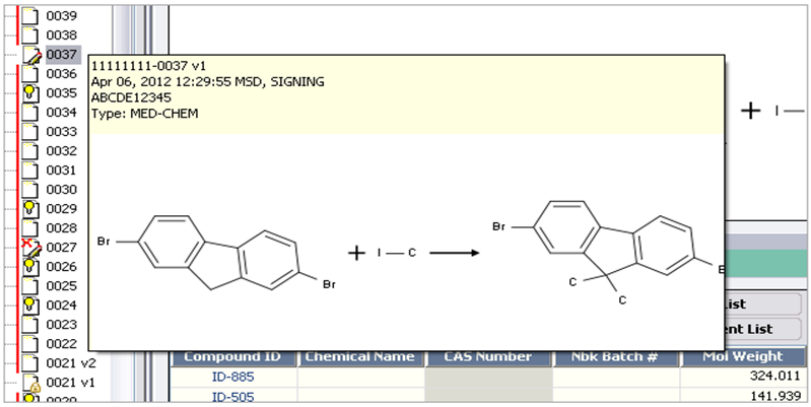


Figure 36. Signature status of an experiment

The following are signing states:

- *Submitted* – a new document is just uploaded to Indigo Signature and has no signatures
- *Signing* – at least one signature is complete, but not all
- *Signed* – all signatures are complete
- *Archiving* – document is being archived
- *Archived* – document is archived
- *Submit-Fail* – document is rejected

As the final stage of the signature process, the document is marked as archived.

To see the signed version of an experiment, in the Navigation pane, right-click the experiment in Archived state and click ***View Record Archived***.

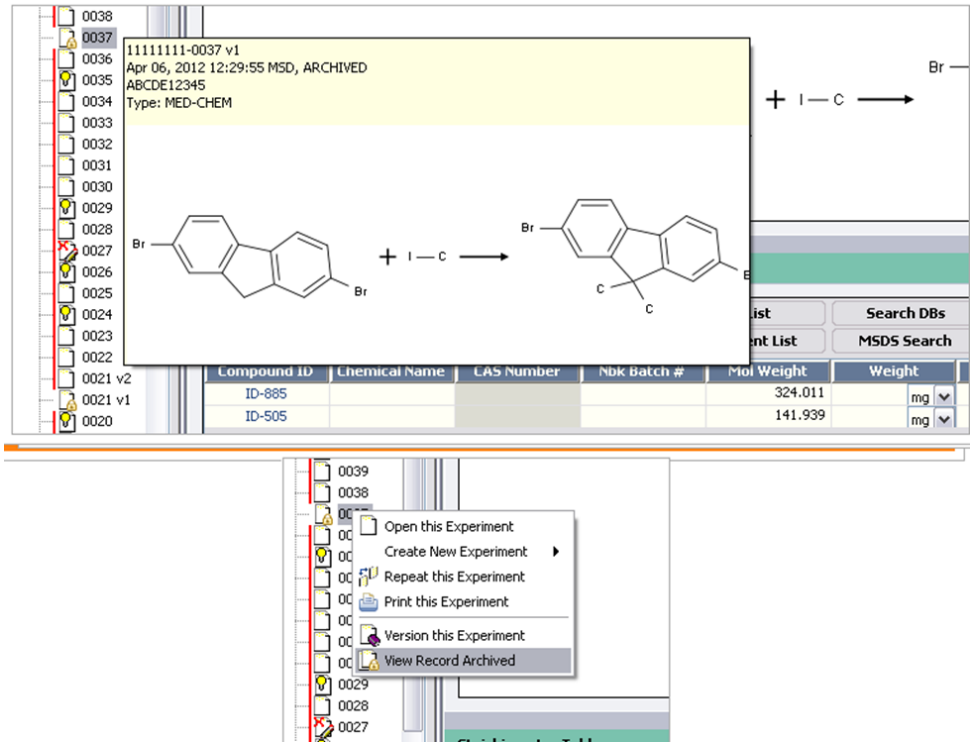


Figure 37. Signature status and viewing a signed experiment

4. TABLE OF FIGURES