

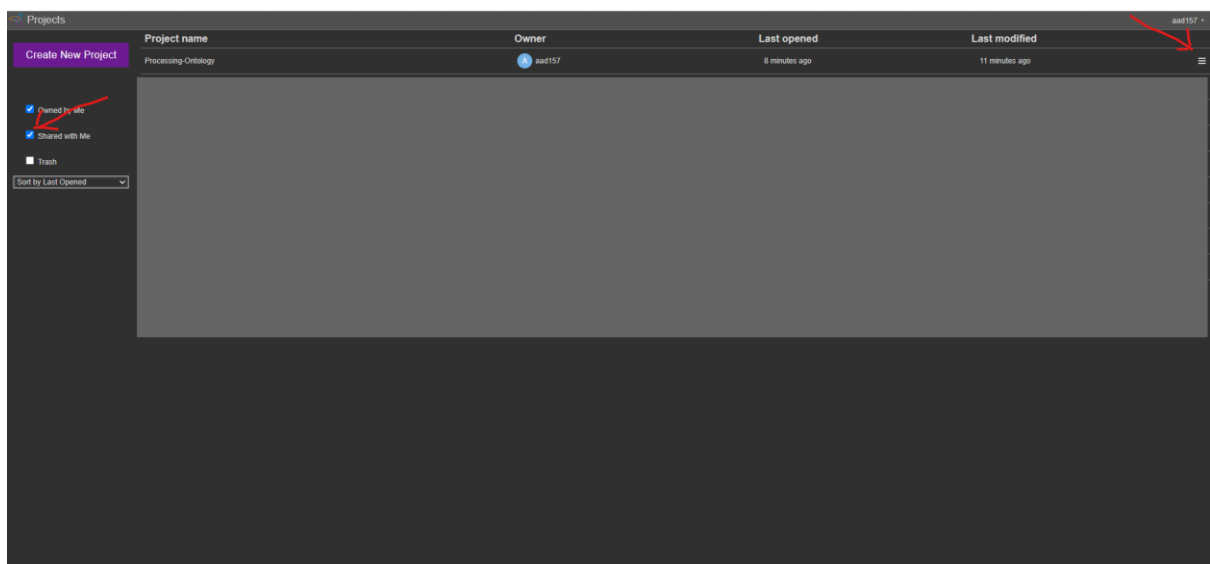
Web Protégé Ontology Building

Prerequisites: -

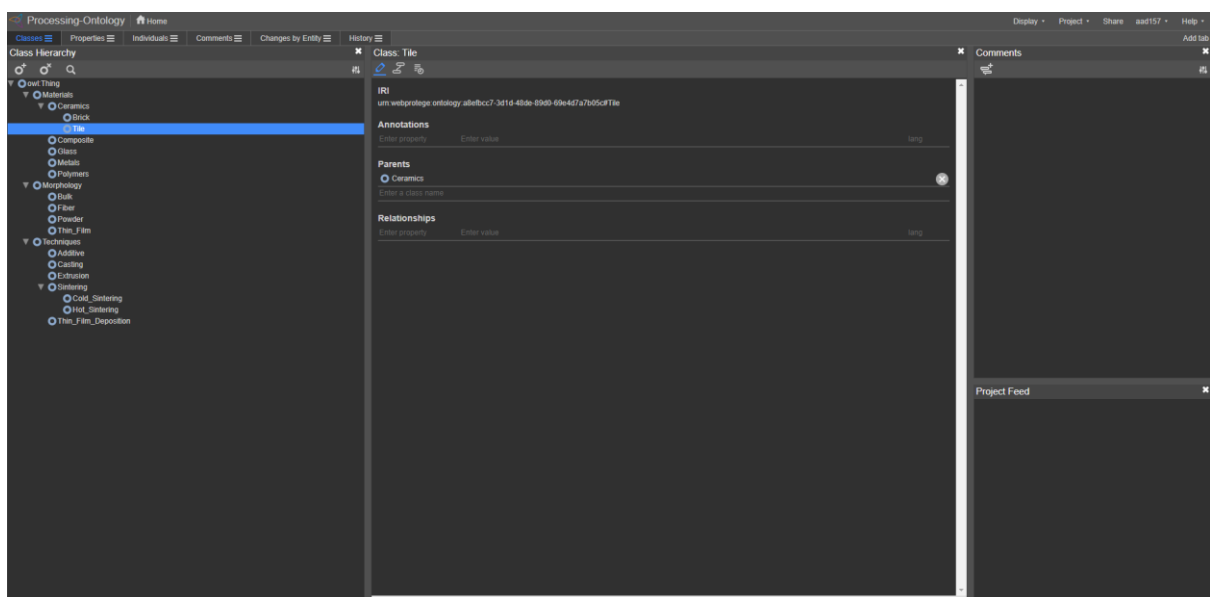
- Create account on <https://webprotege.stanford.edu/#login>
- Share your username on <https://ecgcwru.slack.com/archives/C02LK35C7A5>
- Download and install Protégé on local computer and install all the extensions.

Steps to be followed: -

- Login into Web Protégé and open the shared project Processing-Ontology (make sure to select the Shared with me option on left side of the window).
- Select the three horizontal lines on the right-hand side of the project and click Download



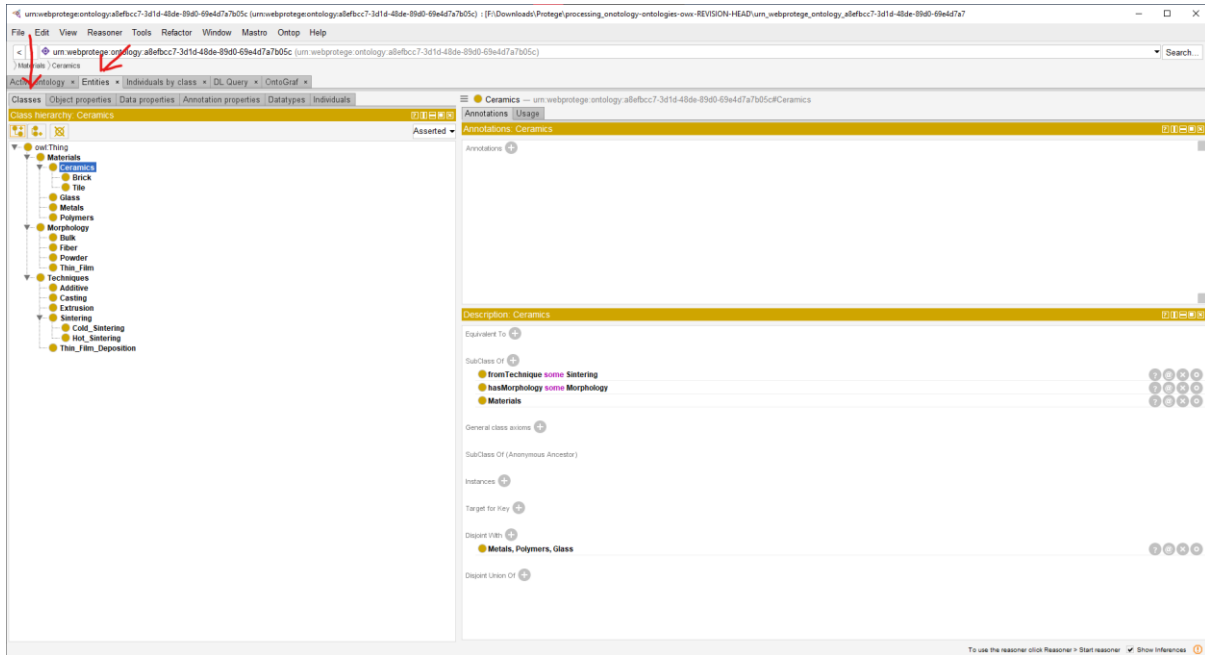
- Open Processing-Ontology



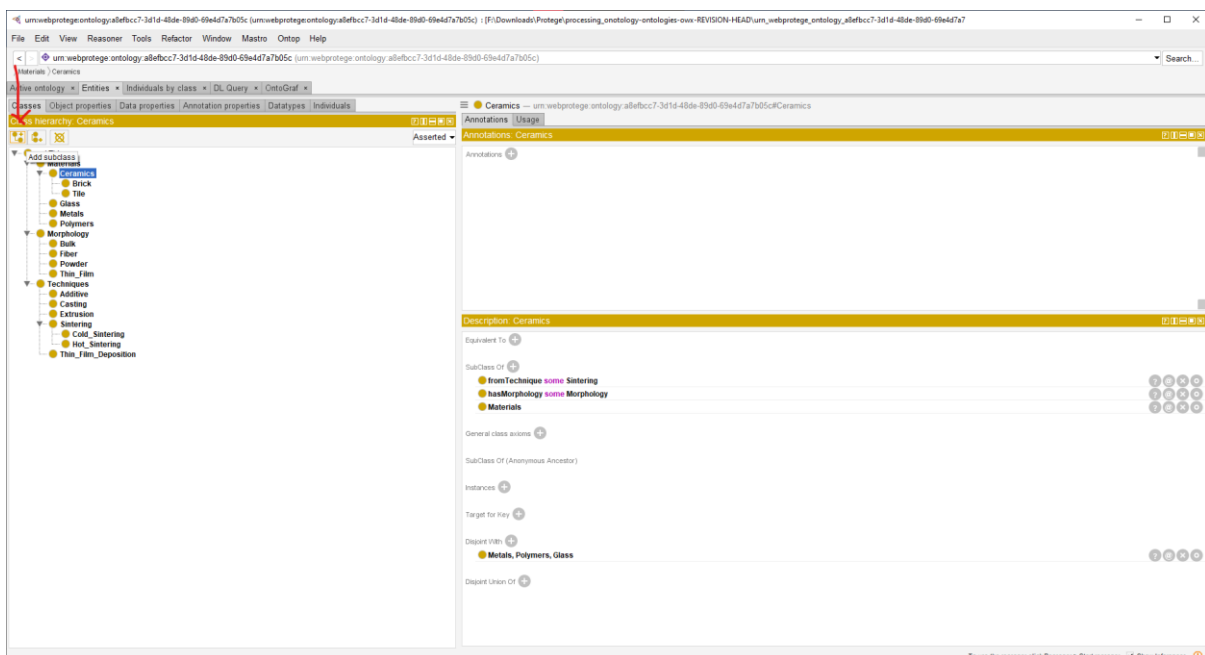
- Create new sub classes (elements) in the main three categories by selecting the O+ button under Class Hierarchy on the top left-hand side.
- Delete a created subclass by selecting Ox button next to create button.

Creating new Subclass under Super Class in local Protégé :-

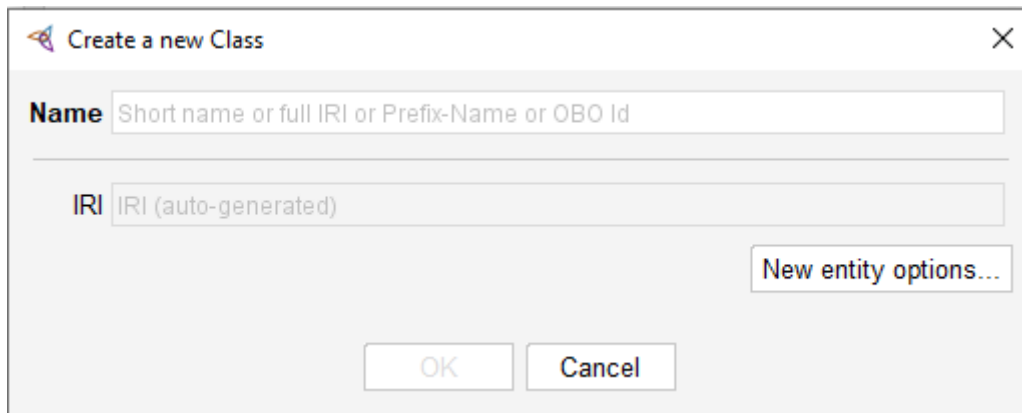
- Open the downloaded ontology file in local Protégé by selecting under File menu on left side top corner.
- Select Classes under Entities to view the Ontology.



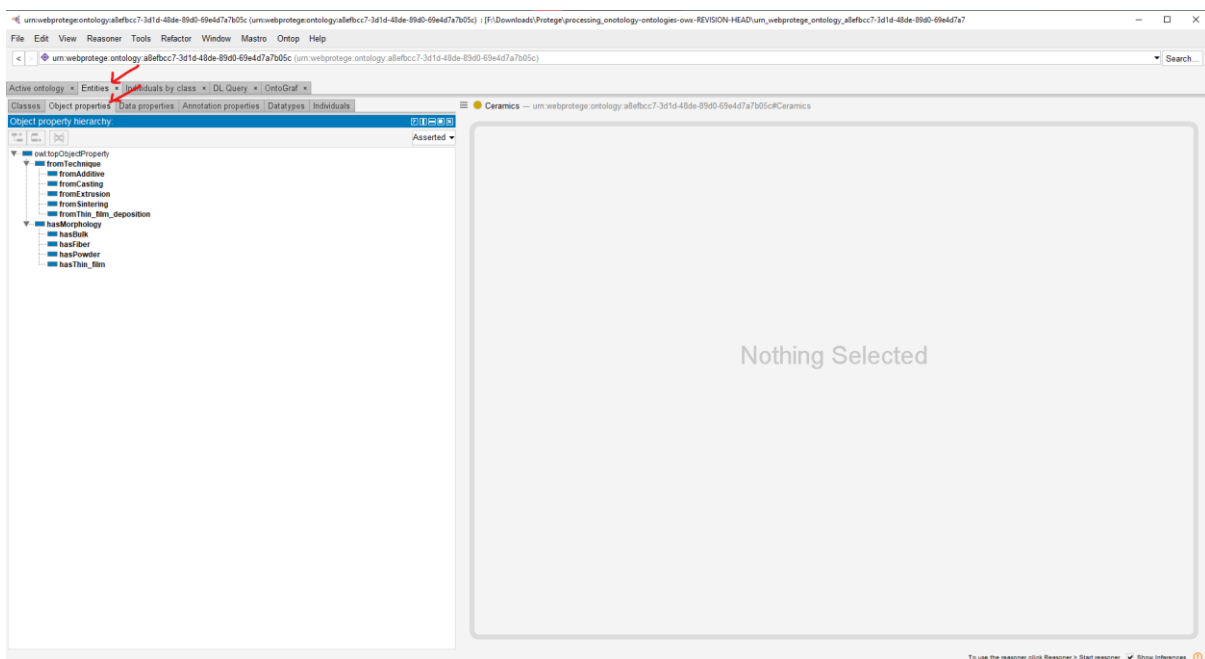
- Select the Class under which you wish to add Subclass
e.g. Add new subclass under Ceramics then select Ceramics.
- Select add subclass in top left corner of Class Hierarchy window to add a new subclass.



- This will open a popup window for the naming the subclass. Enter the desired name and select ok. This will add a new subclass under the desired parent class.



- Whenever a new Technique / Morphology is created, Object Properties need to be created for the particular Technique / Morphology for linking the Materials to Technique and Morphology.



- Similar to class generation we generate new object properties under Technique and Morphology.

NOTE: suffix needs to be added to object property to distinguish it from class.

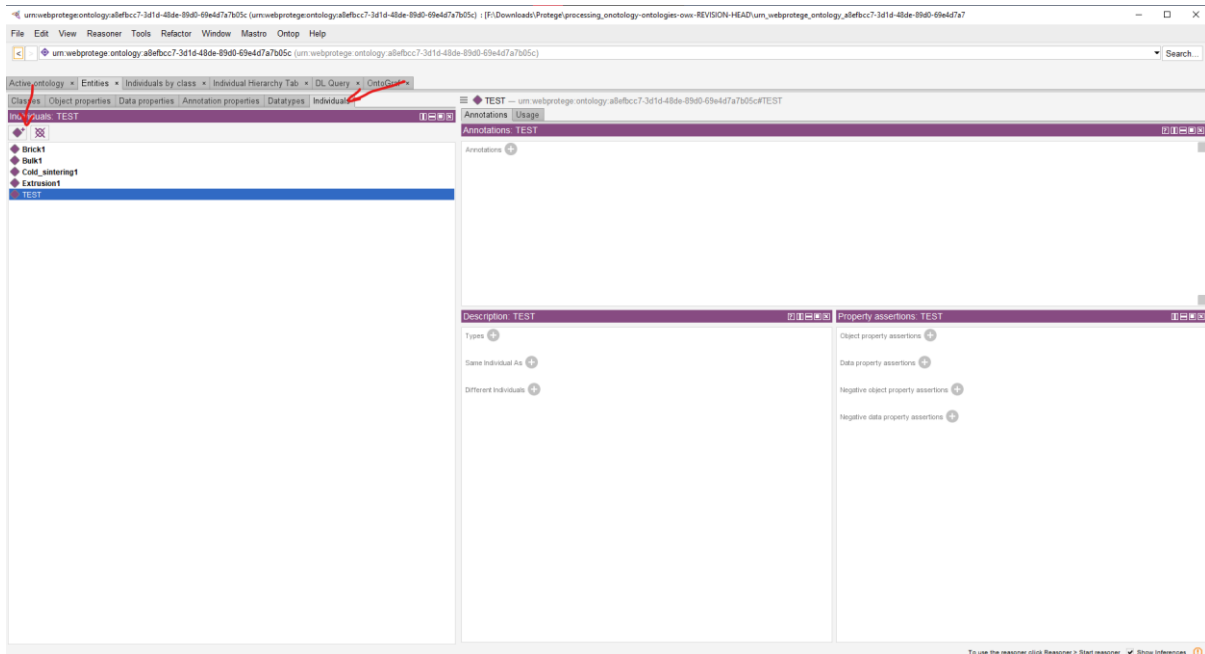
e.g. “some” for Technique and “has” for Morphology

- New Techniques and Morphologies are generated similar to classes by giving them name in the popup window.

- Once the Classes , Techniques and Morphologies are generated we move to linking the three

Creating new Individuals for each Technique and Morphology:

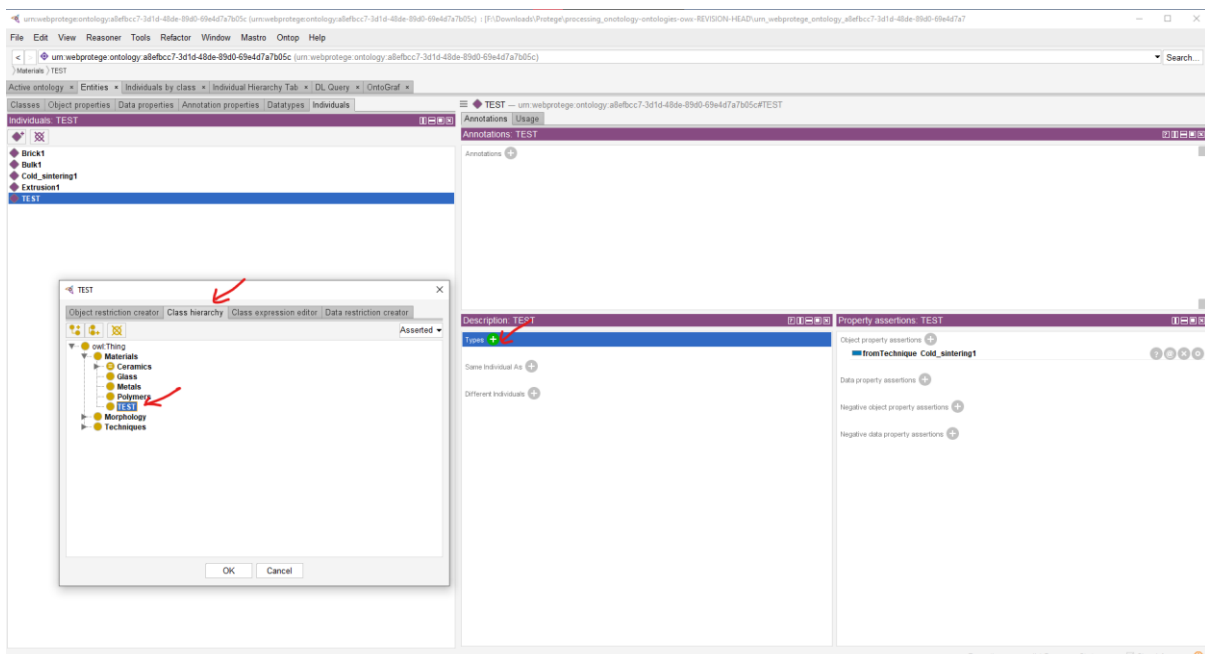
- Select the button on the right side under individuals tab as shown below.



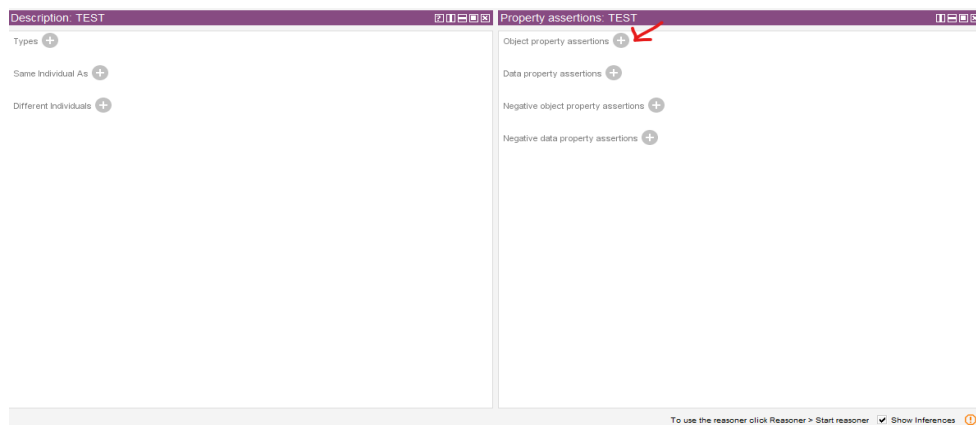
- In the popup window enter the name of Technique or Morphology that you wish to create and add a number after the name to distinguish from the subclass already present. (As shown in the figure above)
- Once all the Individuals are created we will start **building relations between the individuals**.
- SELECT THE PARTICULAR INDIVIDUAL THAT YOU WISH TO BUILD CONNECTIONS and select + in the description window on left next to **Types**, to define the type of individual. Follow the steps in as shown in image in popup.

NOTE: The class in popup window should be the class of the individual it was generated for

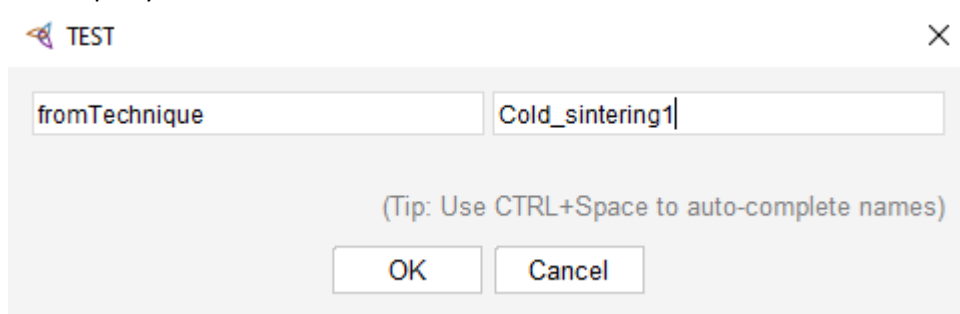
e.g. Brick1 should have type Brick



- Select + in the description window on left next to **Object Properties assertions** to create relations between individuals.



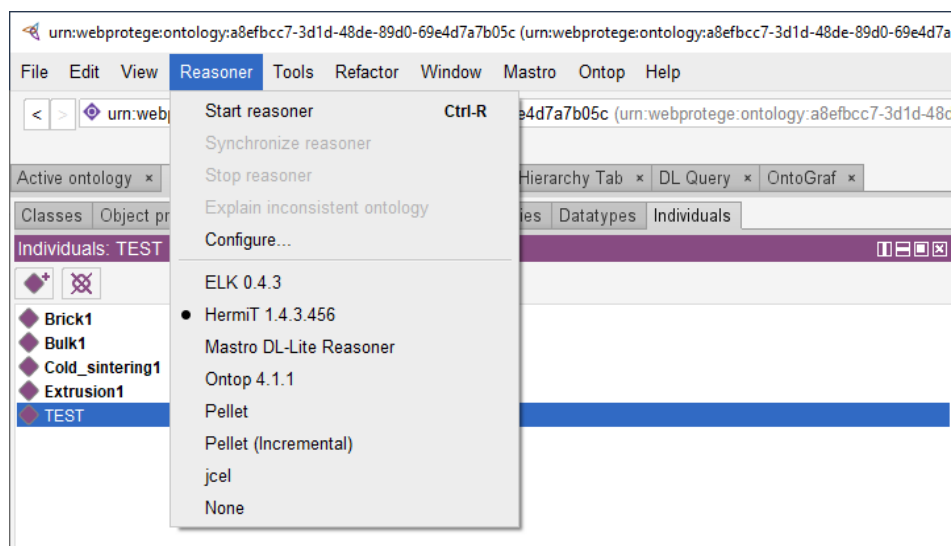
- After selecting the + button next to object properties a popup window will appear to enter the Property and individual entries.



- As shown in the example object properties can be chosen between “fromTechnique” and “hasMorphology”.
- The individual entry is done based on the created or existing individuals created.
- After selecting OK we have successfully created a link between two individuals.

NOTE: Multiple Relation can be added under Object Properties.

- Now the important part is to run the Reasoner which verifies the relation. Reasoner is present in the top horizontal bar next to View button. After selecting Reasoner the below should be visible.



- Select Hermit reasoned if the list of reasoned is not visible you need to exit the application and restart it to install all the Pulgins. (VERY IMPORTANT)
- Once you have selected Hermit select **Start Reasoner** to initiate the reasoner.

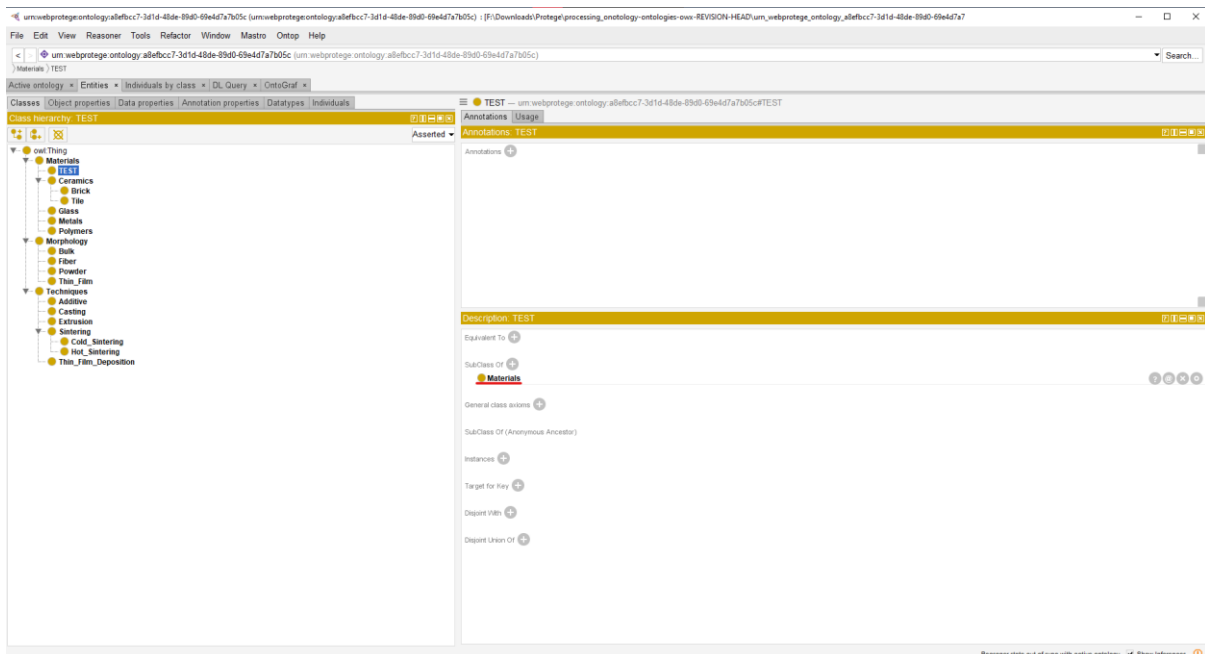
If you see any relations red that means the relation is conflicting you need to verify the relation and start over again.

We have successfully generated and verified the relations between different individuals.

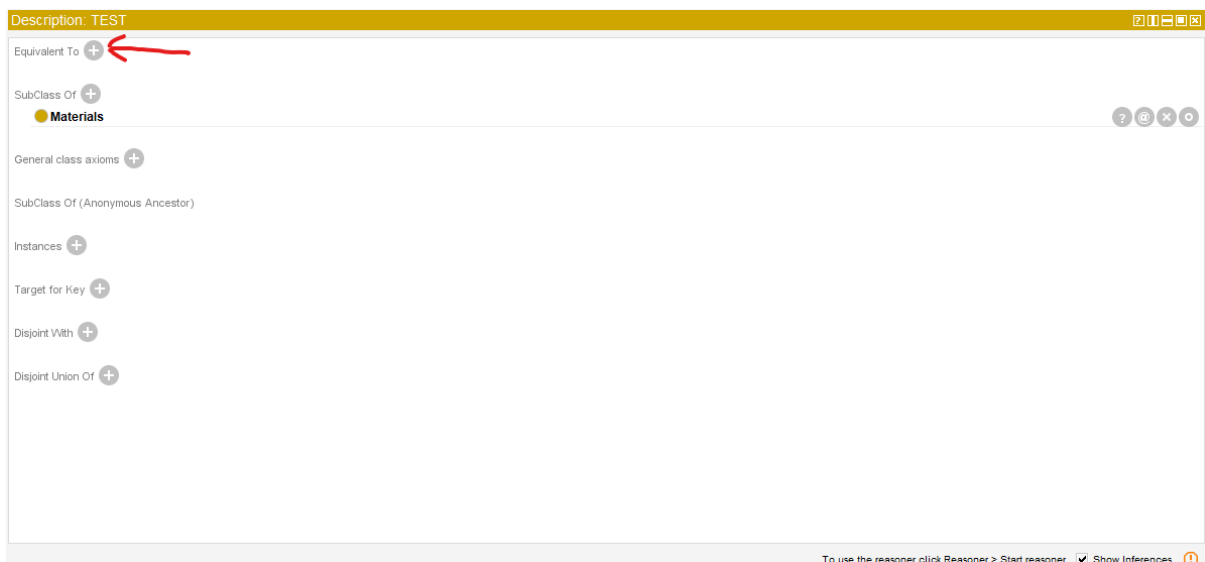
Creating Relationships between nodes in local Protégé :-

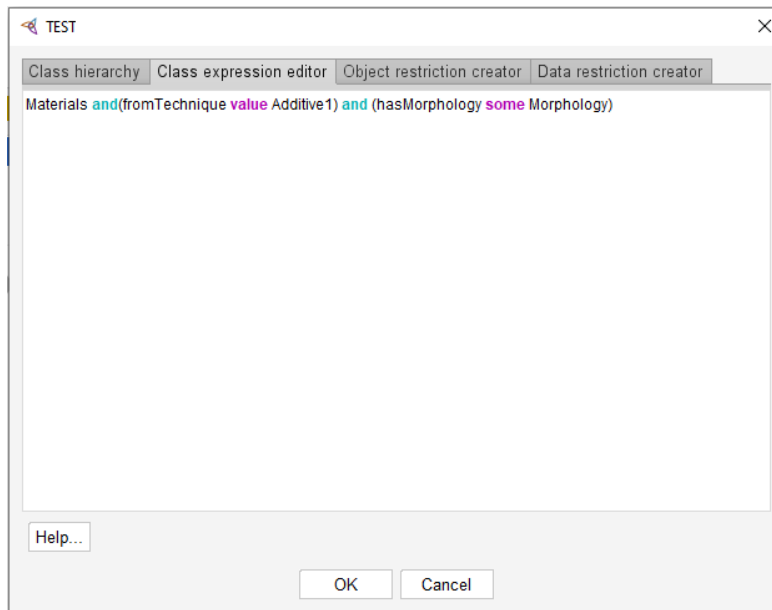
- We need to define the relation for the newly created subclass.
- The Description section should already have the name of superclass under **SubClass Of**

Image Depicts the Description of New Class TEST which is Subclass of Materials the section is already populated.

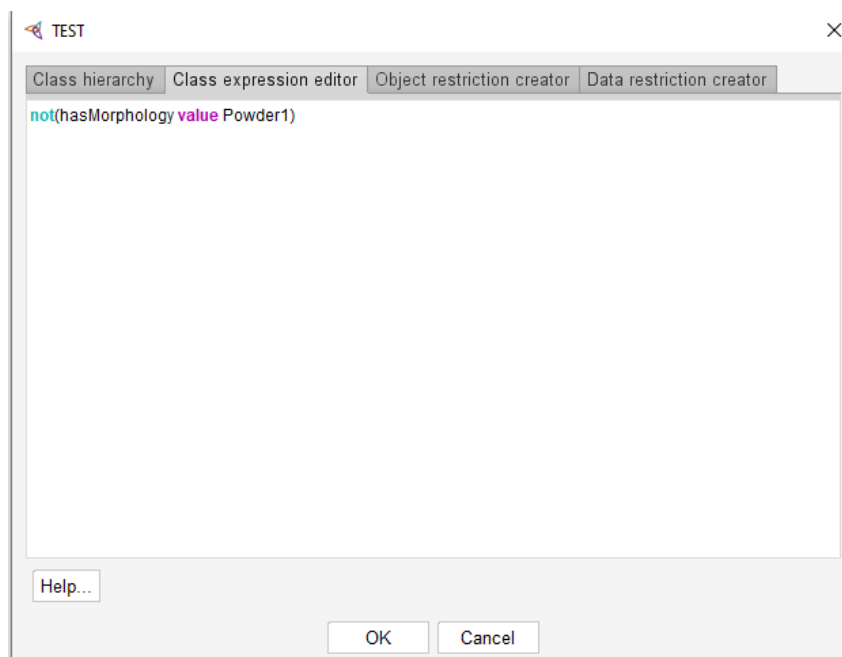


- The next step is to link the new subclass with Morphology and Technique which is done by clicking the + symbol next to **Equivalent To**





- We have to write the condition that should be followed by the new subclass as shown if the subclass under Materials need to have Technique and Morphology add it in the given manner. The Additive1 individual can be replaced by any other individual of choice. Word “value” should be added before an individual and “some” should be added before class.
- Here TEST material manufactured by additive manufacturing procedure can have multiple Morphologies so we add the class in the condition.
- Select OK to apply this condition.
- If we are sure that the test material manufactured by Additive manufacturing will never have a particular morphology we can add it up as a second new condition in the following manner.

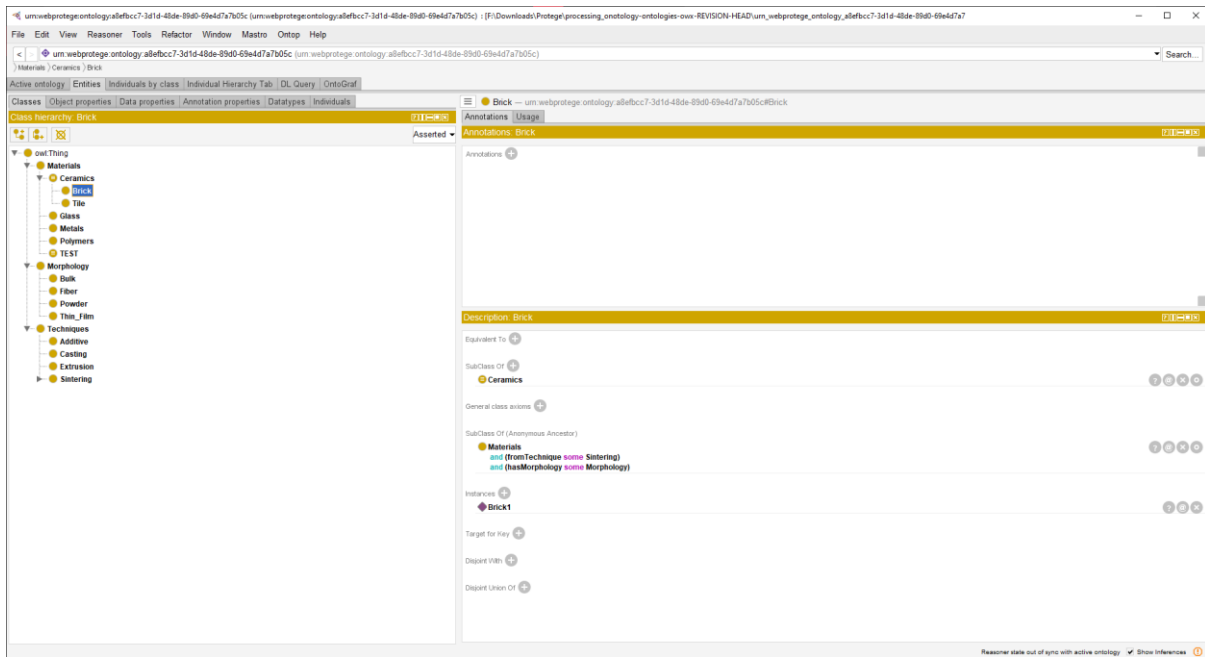


- Select OK to apply the condition.
- Thus we have successfully applied condition to subclass.

- If you create a sub class of a subclass following needs to followed.
- Select the newly created subclass and make sure the property **Subclass Of (Anonymous Ancestor)** is auto populated.

IF NOT make sure your Subclass is generated under a Super class. Repeat the previous steps to generate a sub class under the super class.

(Delete the non-functional created sub class before creating a new subclass.)

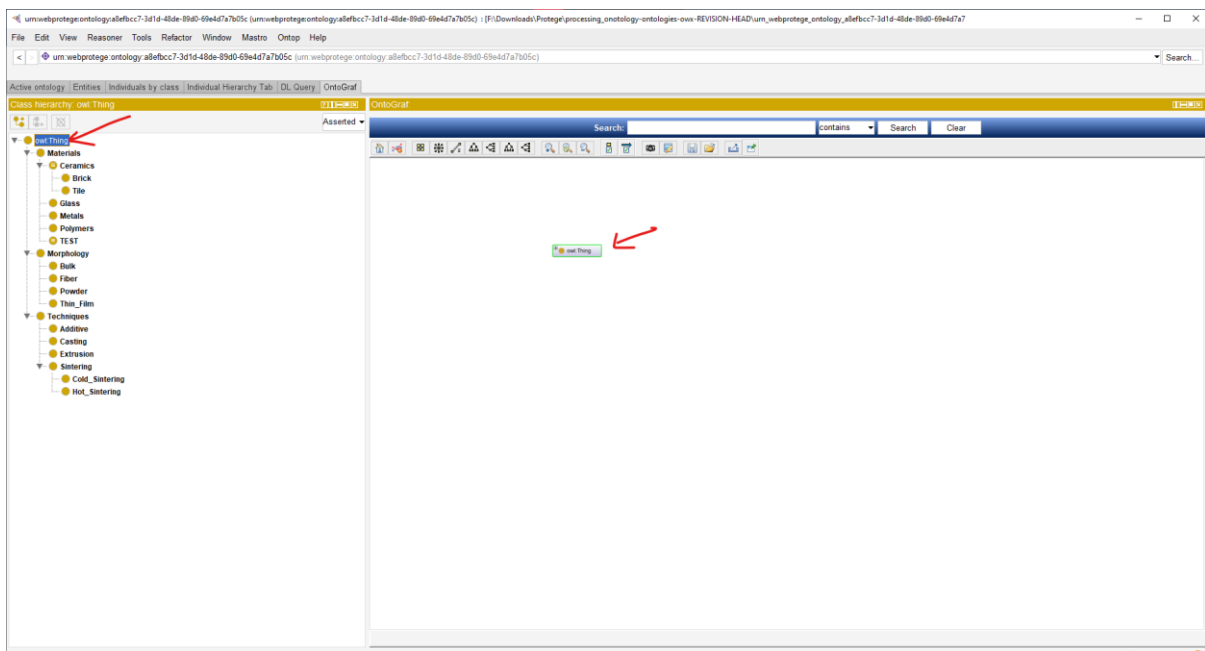


- As shown in the figure for subclass **BRICK** of **Ceramics** the conditions are auto populated.

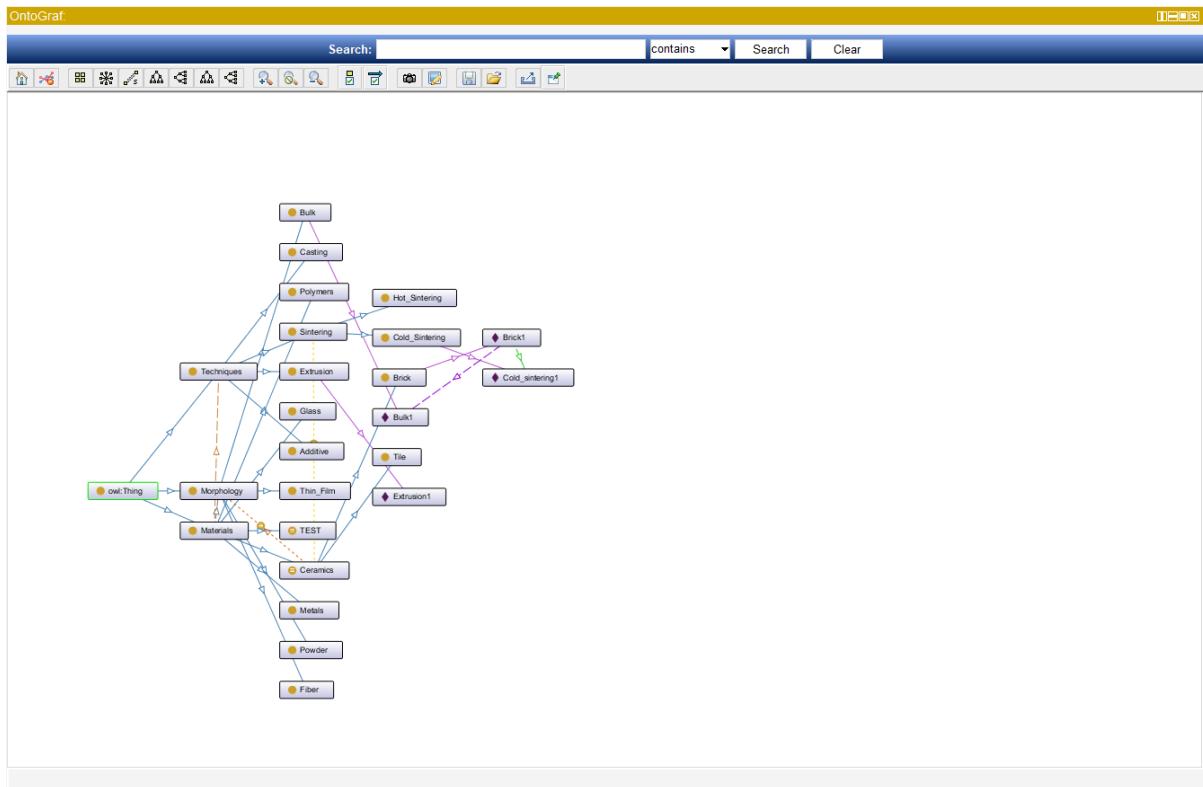
At the end select Reasoner and select **Synchronize Reasoner OR press Ctrl + R** to verify the generated conditions. This verifies all the generated links now we move over to Visualisation Part.

Visualisation of Ontology:

- Select Windows > Tabs > **OntoGraf** to visualise the ontology.
(OntoGraf is installed via Pulgins)



- As displayed after selecting owl:Thing in left Tree the right window should display a node with the same name.
- Expand all the node by double clicking them. Only the nodes with a + on them can be expanded.
- Make sure all the nodes are expanded to visualise the relations.



MUST READ

- The Ontology depicted in the tutorial need not to be following the technicalities of Material Science Engineering.
- Play around to explore new options and create relations.

IMPORTANT:-

At the end after creating the ontology in local PROTÉGÉ save the file and please upload the file to Gdrive > ECG > upload > ontology > Your Name > file.

CONTACT DETAILS:

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Feel free to connect for any query. Advisable to post your query in Slack Group so everyone benefits from it.