Subject: Reaction enumeration with aromaticity
Posted by mattiafelice.palermo on Tue, 01 Jun 2021 16:19:01 GMT
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Hello everyone,

I'm trying to create a reaction where a quinone-containing molecule (non aromatic) is reduced to hydroquinone (aromatic).

The input reaction I wrote is:

In the input reaction, the carbon bonds of the product rings and "sidegrop" are automatically converted to delocalized by Datawarrior.

These are the reactants:

When I try to run the reaction, Datawarrior outputs a list of empty products:

I am probably doing some very basic mistake, but I cannot figure out what I'm doing wrong... Can anybody point out what should I do to obtain the list of products?

Thank you very much for your help and let me know if you need any additional information!

Mattia

File Attachments

1) products.png, downloaded 781 times
2) reactants.png, downloaded 841 times
3) reaction.png, downloaded 888 times

Subject: Re: Reaction enumeration with aromaticity
Posted by thomas on Tue, 01 Jun 2021 22:38:10 GMT
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Hi Mattia,

this was indeed a tricky one. I have checked and finally found that the problem was caused by the valence check after doing the substructure search of the generic in the real reactant. The check determines, whether all atoms in the real reactant have enough free valence needed for the reaction. For that it determines the delta between generic product and reactant atoms. Here was the problem: for the atoms with mapping numbers 4 and 9 it found the product atom valences to be +1 higher than their respective reactant valence. Since the real reactant valence atoms at the

corresponding position had already the maximum valence of 4, they were sorted out after the substructure match. Calculating free valences with delocalized bonds is a tricky matter. It gets even worse, if multiple bond orders are allowed.

I have fixed this issue and deployed an update of DataWarrior. The dev patch is downloadable from the small print links on the download page after clicking the 'read and understood' checkbox. Some general tips: typically query features are only needed on the reactant side; delocalized bonds may be avoided by using the 'aromatic' query feature for bonds or atoms. A drawn double bond also matches a delocalized bond (in the reactor context). Thus, the following picture is equivalent to your generic reaction.

Hope, this solves it. Otherwise please let me know.

Thomas

File Attachments

1) reaction.png, downloaded 753 times

Subject: Re: Reaction enumeration with aromaticity
Posted by mattiafelice.palermo on Wed, 02 Jun 2021 21:22:20 GMT
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Hi Thomas,

thank you so much for your prompt fix and for the in-depth explanation. I apologize for the late reply, today in Italy it's national holiday!

I have updated to the development version and tried the equivalent reaction you have shown in the picture (double bond+aromatic flag), and it works as expected :)

Unfortunately, trying to do the same with the delocalized bond version still outputs an empty product. Perhaps I'm doing something wrong? I am attaching the rxn file in case it can be of use. Let me know if I can provide any additional information to reproduce the error.

Anyways, even though for me it is more intuitive to work with the delocalized representation, of course the double bond + aromatic flag will definitely do!

Thank you very much for your help and for the wonderful free software!!

Mattia

File Attachments

1) QUI_ox-red_002.rxn, downloaded 488 times