

Overview of Research Topics: Organic Synthesis Group at the University of Potsdam

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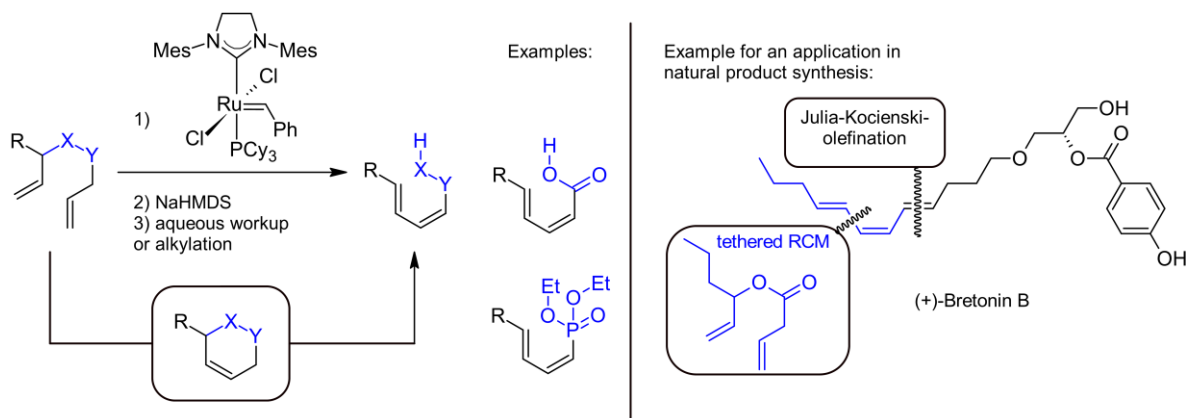
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Synthetic Methodology: Tethered Olefin Metathesis Reactions

This method allows the stereoselective construction of (*Z,E*)-configured conjugated dienes and proceeds through a sequence of Ru-catalyzed ring closing metathesis of α,ω -dienes, base-induced elimination and trapping of the reaction products with electrophiles. By using carbonyl olefination reactions the conjugated diene can be extended to polyenes or diene-yne. An example for the application in total synthesis is the marine natural product (+)-bretonin B.

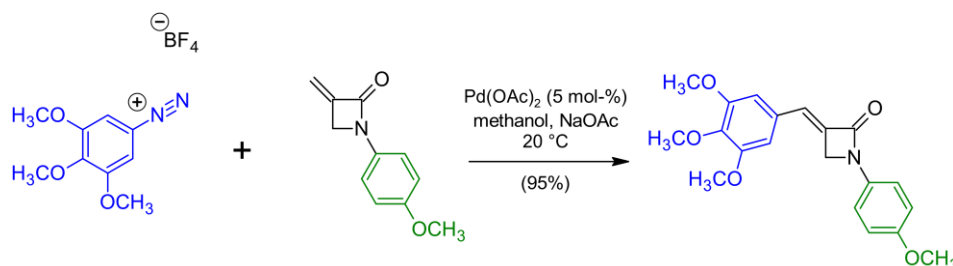


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Synthetic Methodology: Pd-catalyzed Coupling Reactions with Arene Diazonium Salts

We have investigated novel applications of Matsuda-Heck reactions and other Pd-catalyzed couplings using arene diazonium salts. Recent examples include the stereoselective synthesis of aryl C-glycosides, functionalized exo-arylidene- β -lactams, investigations into the regioselectivity of the β -hydride elimination step in Matsuda-Heck reactions, biaryl syntheses using organo-bismuth and -indium reagents, and Matsuda-Heck couplings of vinylsulfone compounds. For the latter case we showed that kinetic data can be determined by measuring the evolution of nitrogen over time.

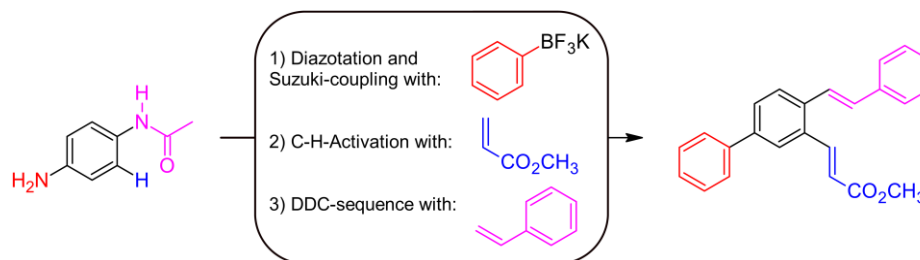


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Synthetic Methodology: Dual-use Catalyst-directing Groups

Acetanilides are catalyst-directing groups in transition metal catalyzed C-H-activation and facilitate, for instance, oxidative Heck-coupling reactions with olefins. We have developed a method that enables the traceless removal of the catalyst-directing group through its one-pot conversion into a diazonium cation, which subsequently acts as a leaving group in Pd-catalyzed coupling reactions (deacetylation-diazotation-coupling-(DDC)-sequence). The dual-use concept for catalyst-directing groups allows the site-selective multiple functionalization of arenes:



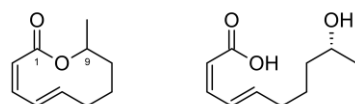
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Target Molecule Synthesis: Structure Revision and Elucidation

By total synthesis of natural products, sometimes using synthetic methods developed in our group, we have been able to contribute to structure elucidation and revision of natural products. Some examples:

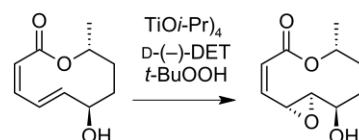
The published structure of fusanolide A was corrected to its seco acid (curvulalic acid) and the absolute configuration at C9 was elucidated:



Fusanolide A

Curvulalic acid

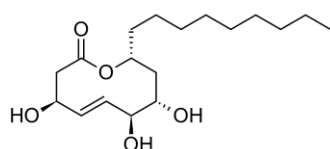
Absolute configuration of stagonolide E at C9 was confirmed; absolute and relative configurations of all stereocentres in curvulide A were elucidated:



Stagonolide E

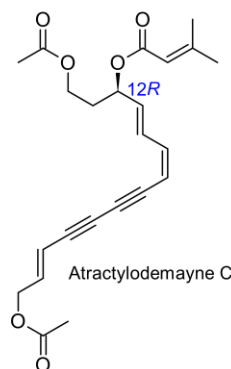
Curvulide A

Both enantiomers of seimatopolide were synthesized from chiral pool starting materials, enabling unambiguous assignment of their absolute configurations. The structure of natural (-)-seimatopolide was thereby revised:



Revised structure of seimatopolide A

The originally assigned absolute configuration of atractylodemayne natural products at C12 was revised to *R*, based on ex-chiral pool (malic acid) total synthesis:



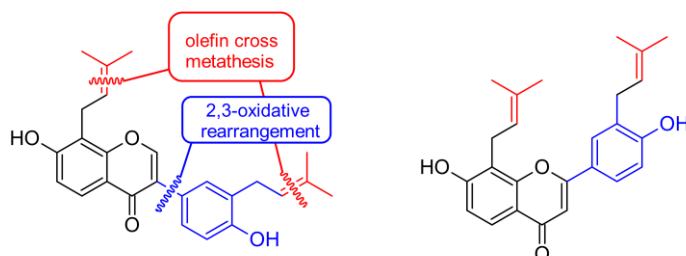
Atractylodemayne C

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Target Molecule Synthesis: Bioactivity Studies

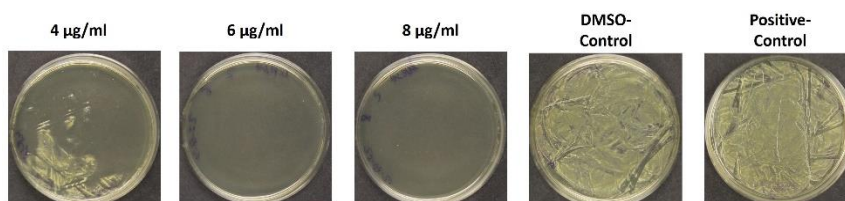
Secondary plant metabolites, some of them previously isolated from African medicinal plants by our collaboration partners at the University of Nairobi, were synthesized and tested for their antibacterial properties (in collaboration with Dr. M. v. Nickisch-Roseneck and Dr. S. Kersting, Fraunhofer IZI-BB, Golm):



Erysubin F, an isoflavone from the East African medicinal plant *Erythrina saclexii*, is active against methicillin-resistant *Staphylococcus aureus* (MRSA) at 15.4 μM (MIC).

Isoerysubin F, the non-natural flavone isomer of Erysubin F, shows similar activity against methicillin-resistant *Staphylococcus aureus* (MRSA) at 20.5 μM (MIC).

7,4'-Dihydroxy-8,3'-diprenylisoflavone (Erysubin F) against MRSA (ATCC43300)



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