

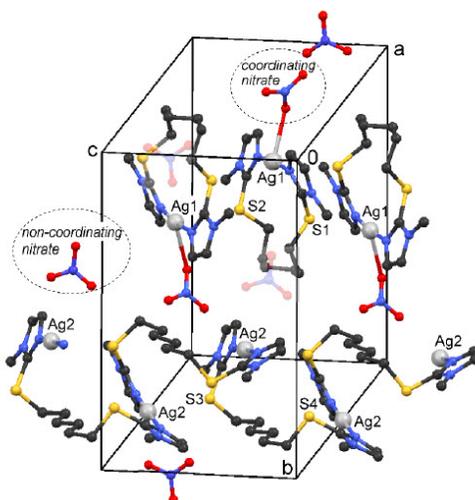
## The ISHC Bulletin

### Recent Publications of ISHC Members

Issue 26; December 2018

### Polymeric Silver(I) Complexes Based on Bidentate Imidazoline-2-thiones. Synthesis and Crystal Structures

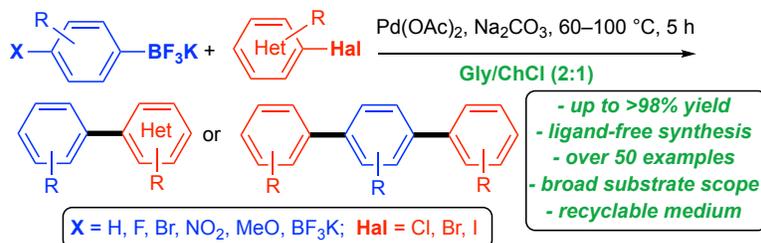
Barbara Rietzler, Gerhard Laus, Klaus Wurst, Thomas Gelbrich, Sven Nerdinger, Erwin Schreiner, and Herwig Schottenberger  
*Heterocycles* **2018**, *97*, 211–217. DOI: 10.3987/COM-17-S(T)3



**Abstract:** The bidentate ligand 1,6-bis(1-methylimidazol-2-ylthio)hexane or its hexafluoride salt reacted with silver(I) triflate, nitrate or oxide, respectively, to give the corresponding polymeric silver(I) complexes. Three crystal structures have been determined and showed linear and cyclic motifs.

### Ligand-Free Bioinspired Suzuki–Miyaura Coupling Reactions using Aryltrifluoroborates as Effective Partners in Deep Eutectic Solvents

Giuseppe Dilauro, Sergio Mata García, Donato Tagarelli, Paola Vitale, Filippo M. Perna, and Vito Capriati  
*ChemSusChem* **2018**, *11*, 3495–3501. DOI: 10.1002/cssc.201801382



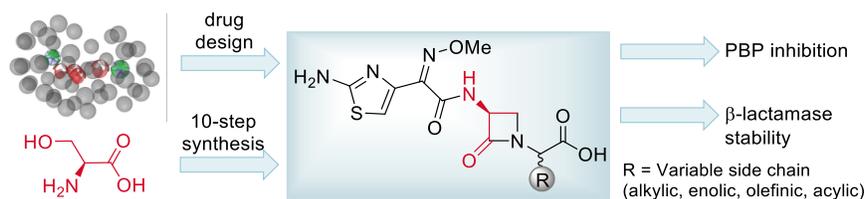
**Abstract:** Pd-catalyzed Suzuki-Miyaura cross-coupling between (hetero)aryl halides (Cl, Br, I) and versatile, moisture-stable mono- and bifunctional potassium aryltrifluoroborates proceeded efficiently and chemoselectively in air and under generally mild conditions; a catalyst loading as low as 1 mol% combined with  $\text{Na}_2\text{CO}_3$  as a base in choline chloride/glycerol (1:2) deep eutectic solvent (DES) was used as a sustainable and environmentally responsible medium. The catalyst, base, and DES were easily and successfully recycled up to six times with an E-factor as low as 8.74. Valuable biaryls and terphenyl derivatives were furnished in yields of up to 98%; over 50 reactions were compared and discussed. The methodology was applied for the synthesis of the nonsteroidal anti-inflammatory drugs Felbinac and Diflunisal.

## In Silico Design and Enantioselective Synthesis of Functionalized Monocyclic 3-Amino-1-carboxymethyl- $\beta$ -lactams as Inhibitors of Penicillin-Binding Proteins of Resistant Bacteria

Lena Decuyper, Sari Deketelaere, Lore Vanparys, Marko Jukič, Izidor Sosič, Eric Sauvage, Ana Maria Amoroso, Olivier Verlaine, Bernard Joris, Stanislav Gobec, and Matthias D'hooghe

*Chem. Eur. J.* **2018**, *24*, 15254–15266.

DOI: 10.1002/chem.201801868



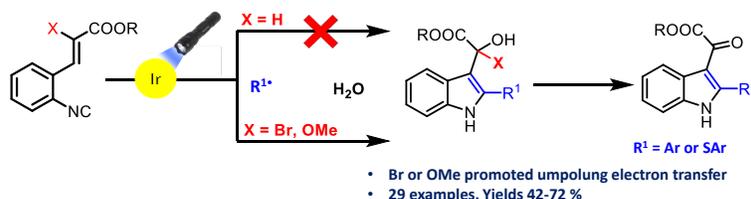
**Abstract:** As a complement to the renowned bicyclic  $\beta$ -lactam antibiotics, monocyclic analogues provide a breath of fresh air in the battle against resistant bacteria. In that framework, the present study discloses the *in silico* design and unprecedented ten-step synthesis of eleven nocardicin-like enantiomerically pure 2-{3-[2-(2-aminothiazol-4-yl)-2-(methoxyimino)acetamido]-2-oxoazetidin-1-yl}acetic acids starting from serine as a readily accessible precursor. The capability of this novel class of monocyclic 3-amino- $\beta$ -lactams to inhibit penicillin-binding proteins (PBPs) of various (resistant) bacteria was assessed, revealing the potential of  $\alpha$ -benzylidenecarboxylates as interesting leads in the pursuit of novel PBP inhibitors. No deactivation by representative enzymes belonging to the four  $\beta$ -lactamase classes was observed, while weak inhibition of class C  $\beta$ -lactamase P99 was demonstrated.

## Bromo- or Methoxy-Group-Promoted Umpolung Electron Transfer Enabled, Visible-Light-Mediated Synthesis of 2-Substituted Indole-3-glyoxylates

Adiyala Vidyasagar, Jinwei Shi, Peter Kreitmeier, and Oliver Reiser

*Org. Lett.* **2018**, *20*, 6984–6989.

DOI: 10.1021/acs.orglett.8b02725



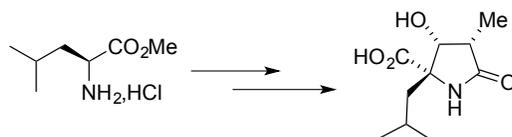
**Abstract:** A visible light-mediated radical tandem cyclization of *ortho*-isocyano- $\alpha$ -bromo cinnamates to 2-substituted indole-3-glyoxylates is achieved by formation of both C-C/C-S and C-O bonds. The reaction proceeds through a hitherto unprecedented bromine or methoxy group-promoted umpolung back electron transfer from an  $\alpha$ -carbonyl radical to the photocatalyst. This way, diverse 2-arylated or 2-thioarylated indole-3-glyoxylates can be prepared. The glyoxylate group installed in the products can be utilized for several biologically relevant manipulations.

## Formal Total Synthesis of (+)-C9-Deoxymuralide from L-Leucine Using a Double Sacrificial Chirality Transfer Approach

Philip C. Bulman Page, Ross L. Goodyear, Alexandra E. Horton, Yohan Chan, Rehana Karim, Maria A. O'Connell, Christopher Hamilton, Alexandra M. Z. Slawin, Benjamin R. Buckley, and Steven M. Allin

*J. Org. Chem.* **2017**, *82*, 12209–12223.

DOI: 10.1021/acs.joc.7b02078

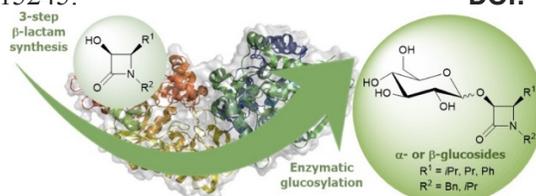


**Abstract:** Formal stereocontrolled syntheses of ( $\pm$ )- and (+)-C9-deoxymuralide is reported, constituting one of the shortest routes to the full carbon skeleton reported to date.

## Chemoenzymatic Approach toward the Synthesis of 3-*O*-( $\alpha/\beta$ )-Glucosylated 3-Hydroxy- $\beta$ -lactams

Lena Decuyper, Jorick Franceus, Shari Dhaene, Maarten Debruyne, Kevin Vandoorne, Nicola Piens, Griet Dewitte, Tom Desmet, and Matthias D'hooghe  
*ACS Omega* **2018**, *3*, 15235–15245.

DOI: 10.1021/acsomega.8b01969

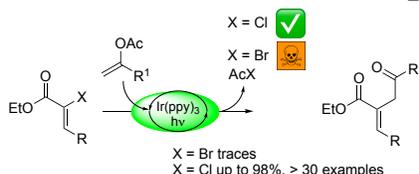


**Abstract:** Glycosylation significantly alters the biological and physicochemical properties of small molecules.  $\beta$ -Lactam alcohols comprise eligible substrates for such a transformation based on their distinct relevance in the chemical and medicinal community. In that framework, the unprecedented enzymatic glycosylation of the rigid and highly strained four-membered  $\beta$ -lactam azaheterocycle was studied. For that purpose, *cis*-3-hydroxy- $\beta$ -lactams were efficiently prepared in three steps by means of a classical organic synthesis approach, while a biocatalytic step was implemented for the selective formation of the corresponding 3-*O*- $\alpha$ - and - $\beta$ -glucosides, hence overcoming the complexities typically encountered in synthetic glycochemistry and contributing to the increasing demand for sustainable processes in the framework of green chemistry. Two carbohydrate-active enzymes were selected based on their broad acceptor specificity and subsequently applied for the  $\alpha$ - or  $\beta$ -selective formation of  $\beta$ -lactam-sugar adducts, using sucrose as a glucosyl donor.

## Ir(ppy)<sub>3</sub>-Catalyzed, Visible-Light-Mediated Reaction of $\alpha$ -Chloro Cinnamates with Enol Acetates: An Apparent Halogen Paradox

Thomas Föll, Julia Rehbein, and Oliver Reiser  
*Org. Lett.* **2018**, *20*, 5794–5798.

DOI: 10.1021/acs.orglett.8b02484

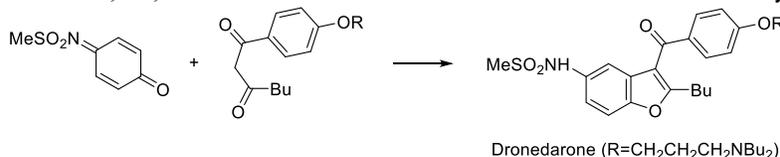


**Abstract:** The visible-light-mediated activation of vinyl chlorides derived from  $\alpha$ -chloro ethyl cinnamates via oxidative quenching of excited photocatalyst *fac*-Ir(ppy)<sub>3</sub> is described. Upon photoelectron transfer and chloride extrusion, the corresponding vinyl radical can be efficiently trapped by enol acetates, giving rise to synthetically useful 1,4-dicarbonyl compounds in good to excellent yields. This transformation is distinguished by mild and environmentally benign reaction conditions and can be performed on multigram scale, in sharp contrast to contrasting  $\alpha$ -bromo ethyl cinnamates, which show low conversion under the various conditions applied.

## A Short Synthesis of Dronedarone

Barbara Piotrkowska, Sven Nerdinger, Erwin Schreiner, Lovro Selič, Piotr P. Graczyk  
*Bioorg. & Med. Chem.* **2018**, *26*, 4330–4335.

DOI: 10.1016/j.bmc.2018.03.041



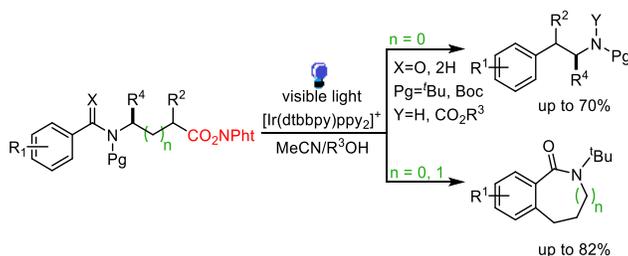
**Abstract:** A modification of the Nenitzescu reaction was used to obtain Dronedarone from quinonimine **20** and 1,3-diketone **14** ( $R = \text{CH}_2\text{CH}_2\text{CH}_2\text{NBu}_2$ ) in a two-stage process in almost 55% overall yield. Our results represent significant improvement over other state-of-the-art methods as no extra steps for the decoration of the benzofuran core are required.

## Visible Light-Mediated Decarboxylation Rearrangement Cascade of $\omega$ -Aryl-*N*-(acyloxy)phthalimides

Christian Faderl, Simon Budde, Georgiy Kachkovskiy, Daniel Rackl, and Oliver Reiser

*J. Org. Chem.* **2018**, *83*, 12192–12206.

DOI: 10.1021/acs.joc.8b01538



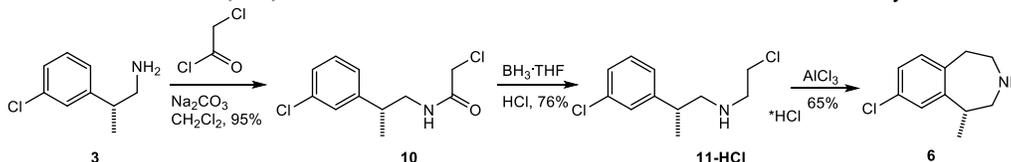
**Abstract:** A Smiles-type radical rearrangement induced by visible light-mediated decarboxylation of  $\omega$ -aryl-*N*-acyloxyphthalimides was developed, giving rise to pharmacologically important substance classes: phenylethylamine derivatives, dihydroisoquinolinones and benzoazepinones were synthesized based on readily available benzoic acids or benzaldehydes and  $\beta$ - or  $\gamma$ -amino acids. This methodology facilitates the synthesis of enantiopure *D*-amphetamine and of precursors of capsazepinoid bronchodilators.

## Synthesis of Enantiopure Antiobesity Drug Lorcaserin

Ivana Gazic Smilovic, Jerome Cluzeau, Frank Richter, Sven Nerdiner, Erwin Schreiner, Gerhard Laus, Herwig Schottenberger

*Bioorg. & Med. Chem.* **2018**, *26*, 2686–2690.

DOI: 10.1016/j.bmc.2018.02.038



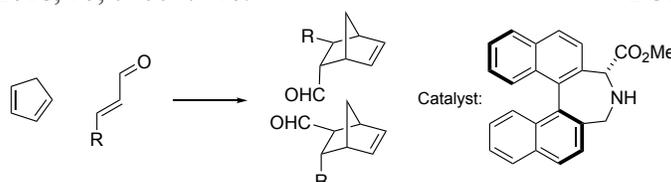
**Abstract:** Acylation of enantiomerically pure (*R*)-2-(3-chlorophenyl)propan-1-amine using chloroacetyl chloride, followed by borane reduction and aluminum chloride catalyzed cyclization yielded enantiopure lorcaserin.

## Novel Binaphthyl and Biphenyl $\alpha$ - and $\beta$ -Amino Acids and Esters: Organocatalysis of Asymmetric Diels–Alder Reactions. A Combined Synthetic and Computational Study

Philip C. Bulman Page, Francesca S. Kinsey, Yohan Chan, Ian R. Strutt, Alexandra M. Z. Slawin, and Garth A. Jones

*Org. & Biomol. Chem.* **2018**, *16*, 7400–7416.

DOI: 10.1039/c8ob01795f



**Abstract:** Asymmetric catalysis of the Diels–Alder reaction between cyclopentadiene and cinnamaldehydes has been studied using as catalysts a range of novel  $\alpha$ - and  $\beta$ -aminoacids and aminoesters with binaphthyl and biphenyl backbones, providing enantioselectivities of up to 62% ee. B3LYP/6-31G\* calculations, including free energy corrections, have been carried out on a binaphthyl catalyst example to identify transition state structures and to aid in the identification of major enantiomers. The calculated product ratios agree well with the experimental data; the transition states identified involve preferential approach of cyclopentadiene along a trajectory adjacent to the acid/ester group. The four lowest energy transition states display a stabilizing dipolar interaction between the carbonyl group oxygen atom and a terminal proton of the diene unit.