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# 有机化学

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中国化学会 主办  
中国科学院上海有机化学研究所

# 有机化学

(月刊)

## Chinese Journal of Organic Chemistry

(YOUJI HUAXUE)

第39卷 第3期 (总364期) 2019年3月\*

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\* 通讯联系人。

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# Chinese Journal of Organic Chemistry

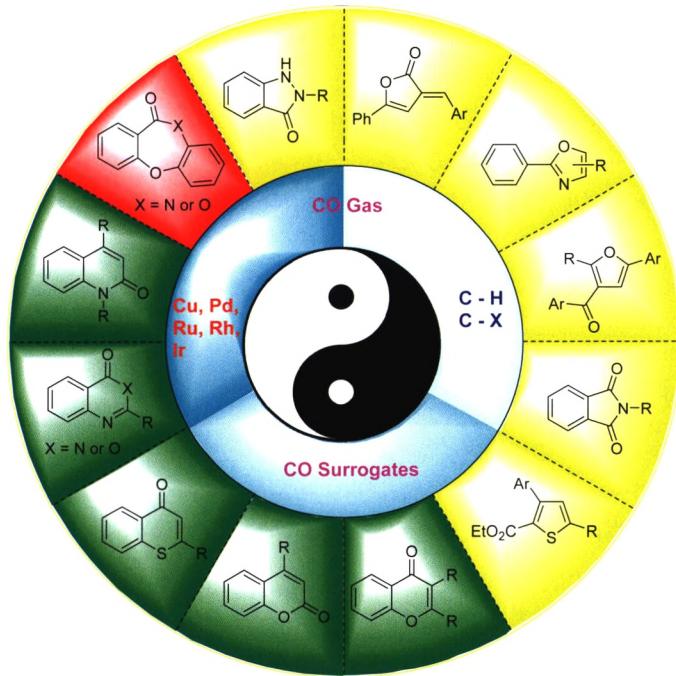
Vol. 39 No. 3 March 2019

## On the Cover

Abnormal levels of reactive nitrogen and reactive oxygen species in humans can cause a variety of diseases, so rapid and efficient detection is particularly important. In recent years, fluorescent probes are widely used because of their high sensitivity and high selectivity. The recent progress of the fluorescent probes used in RNS/ROS detection is reviewed by Jiao, Liu, Lu, Zhang and Wang on page 591.

## ACCOUNT

### Transition-Metal-Catalyzed Carbonylative Synthesis and Functionalization of Heterocycles



Yin, Zhiping; Wang, Zechao; Wu, Xiao-Feng\*

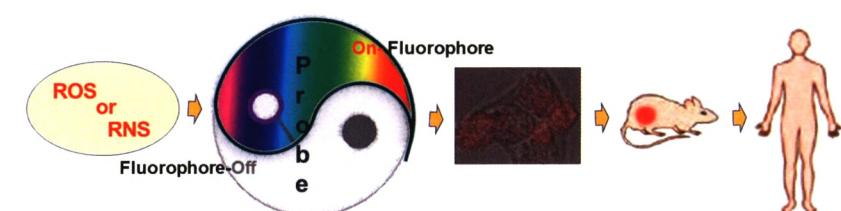
*Chin. J. Org. Chem. 2019, 39(3), 573*

Our progress in the development of transition-metal-catalyzed carbonylative synthesis and functionalization of heterocycles from 2012 to 2018 is summarized. With copper, palladium, rhodium, ruthenium and iridium as the catalysts and relying on the activation of carbon-halogen and carbon-hydrogen bonds, we are able to synthesize various of heterocycles by using CO gas or CO surrogates as the C1 building blocks.

## REVIEWS

### Molecular Fluorescence Probe for Detecting Reactive Nitrogen/Reactive Oxygen

gen



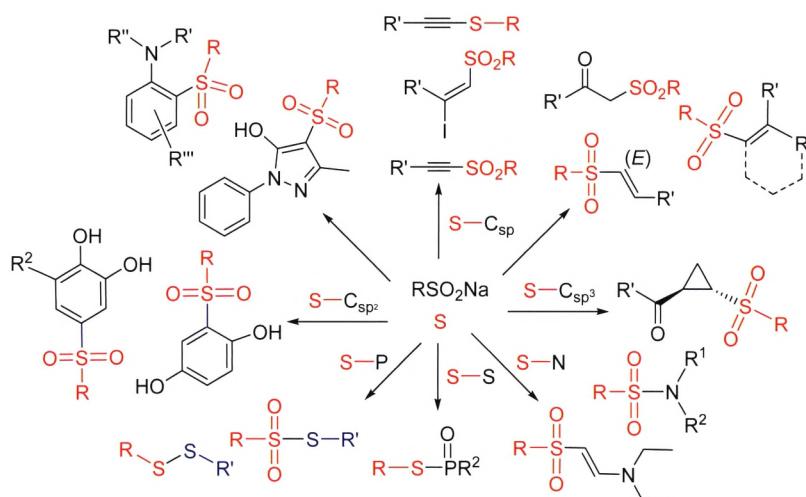
Jiao, Chunpeng; Liu, Yuanyuan; Lu, Wenjuan; Zhang, Pingping; Wang, Yanfeng\*

*Chin. J. Org. Chem. 2019, 39(3), 591*

Fluorescent probes are widely used because of their high sensitivity and high selectivity. The recent progress of the fluorescent probes used in RNS/ROS detection is reviewed.

# CONTENT

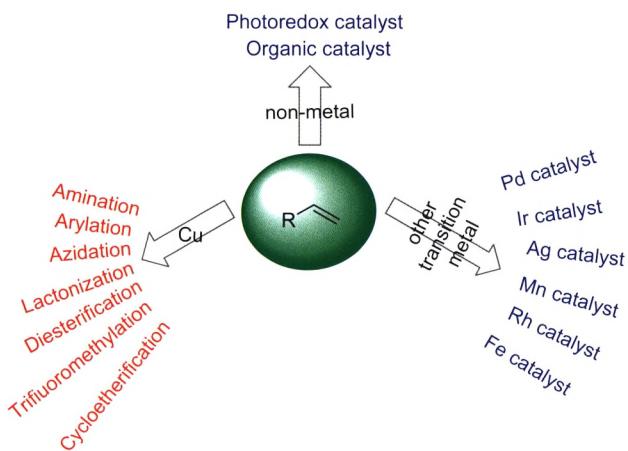
## Recent Progress on Synthesis of Sulfur Compounds by Sodium Sulfinates



The recent progress (2014~2018) on the synthesis of sulfur compounds by sodium sulfinates is summarized. In addition, the organic reactions on the building of S—X (S—S, S—N and S—P bond) and other types of reactions are described respectively, with their scope of substrates and reaction mechanism. It is hoped that this review can be referred to the future application in organic synthesis of sodium sulfinates.

Huang, Guobao; Li, Xiuying; Luo, Jinrong;  
Luo, Zhihui\*; Tan, Minxiong\*  
*Chin. J. Org. Chem.* 2019, 39(3), 617

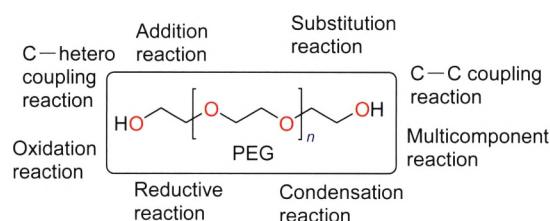
## Progress in Difunctionalization of Alkenes



The bifunctionalization of various alkenes in recent 12 years is reviewed. It can be divided into three parts: copper-catalyzed difunctionalization of alkenes, other transition metal-catalyzed difunctionalization of alkenes, non-metal-catalyzed difunctionalization of alkenes. And the prospects of this reaction are also discussed.

Fu, Xiaofei; Zhao, Wenxian\*  
*Chin. J. Org. Chem.* 2019, 39(3), 625

## Polyethylene Glycol: A New Medium for Green Organic Synthesis



Polyethylene glycols (PEG) as green medium has been employed in many organic reactions, such as carbon-carbon coupling reaction, carbon-hetero coupling reaction, multicomponent reaction, condensation reaction, addition reaction, substitution reaction, oxidation reaction, reductive reaction, and so on. The recent advances of PEG applied in organic synthesis are reviewed.

Xiao, Liwei\*; Dai, Fucai; Li, Zheng; Jing, Xuemin; Kong, Jie; Liu, Guangxian  
*Chin. J. Org. Chem.* 2019, 39(3), 648

**Progress in Copper-Catalyzed Chan-Lam Coupling of N-Compounds**

Duan, Xiyan\*; Liu, Ning; Wang, Jia; Ma, Junying\*  
*Chin. J. Org. Chem.* 2019, 39(3), 661

**Chemoenzymatic Relay Reaction and Its Applications in Highly Efficient and Green Synthesis of High-Value Chiral Compounds**

Liao, Xu; Jiang, Yan; Lai, Shilin; Liu, Yuangang; Wang, Shabin; Xiong, Xingquan\*  
*Chin. J. Org. Chem.* 2019, 39(3), 668

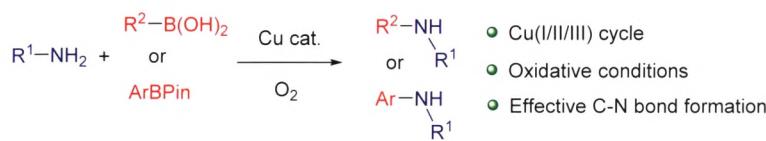
**Progress on Phenanthroimidazole Derivatives in Blue-Emitting Materials**

Qiu, Zhipeng; Tan, Jihua; Cai, Ning; Wang, Kai; Ji, Shaomin\*; Huo, Yanping\*  
*Chin. J. Org. Chem.* 2019, 39(3), 679

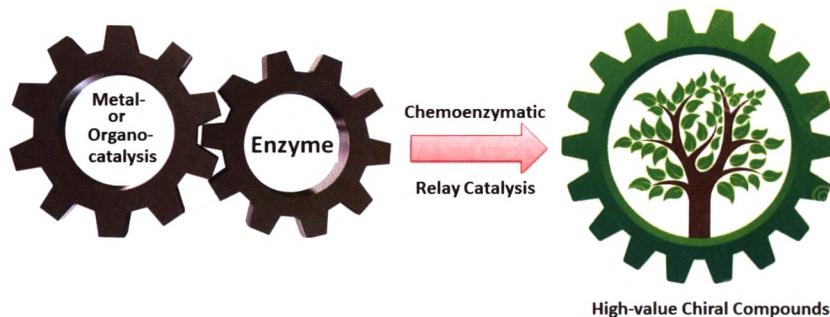
**ARTICLES**

**A Flavone-Based Fluorescent Probe for Hydrazine and Its Bioimaging in Live Cells**

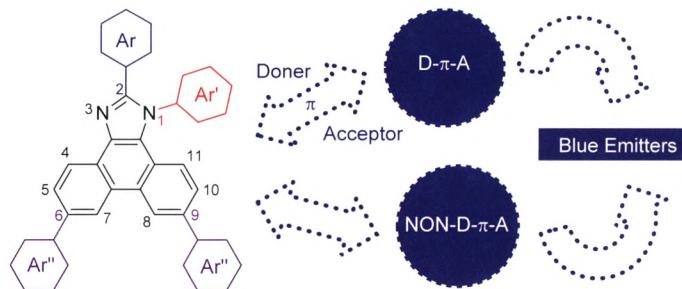
Ju, Zhiyu\*; Shu, Penghua; Shu, Penghua; Xie, Zhiyu; Jiang, Yuqing; Tao, Weijie; Xu, Zhihong\*  
*Chin. J. Org. Chem.* 2019, 39(3), 697



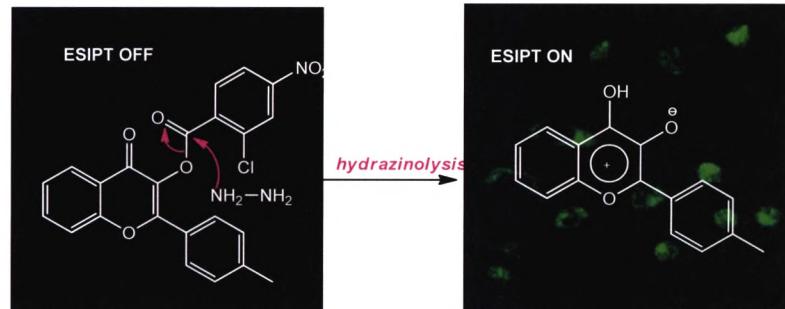
Copper-catalyzed Chan-Lam reactions represent one of the most powerful and straightforward tools to construct C—N bonds. In this paper, the recent progress in Chan-Lam coupling of N-compounds with (hetero)aryl boronates to construct C—N bond based on the reaction mechanism, reaction system, the scope of substrates, etc., is reviewed.



The recent progress in the synthesis of high-value chiral compounds by using chemoenzymatic relay synthesis, such as enzyme and metal catalysis, enzyme and organic catalysis, is reviewed.



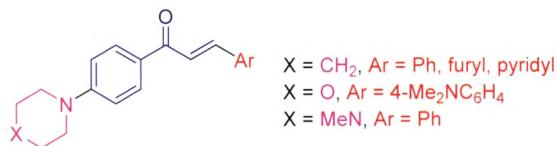
The recent progress in the structures, properties and applications of phenanthroimidazole derivatives is reviewed. The effects of the N1, C2, C6 and C9 substituent on the fluorescent properties are mainly discussed. Finally, the future development and application of phenanthroimidazole derivatives are also prospected.



A flavone-based fluorescent probe **HFBA** was synthesized by the reaction of 2-hydroxyacetophenone with *p*-methyl benzaldehyde. The recognition behaviors of **HFBA** to hydrazine were investigated.

# CONTENT

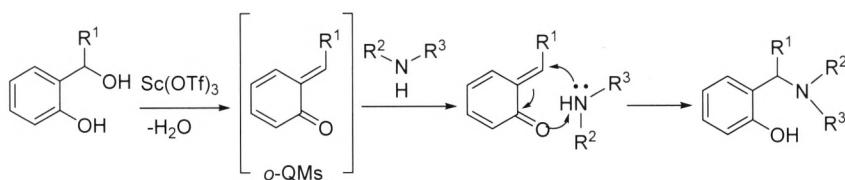
## Synthesis and Evaluation of Chalcone Derivatives as Novel Anticancer Agents



Sheng, Qiwei; Zhao, Wanqiu; Zeng, Ming; Xie, Zhongpao; Xia, Yaping; Cui, Dongmei\*  
*Chin. J. Org. Chem.* **2019**, *39*(3), 703

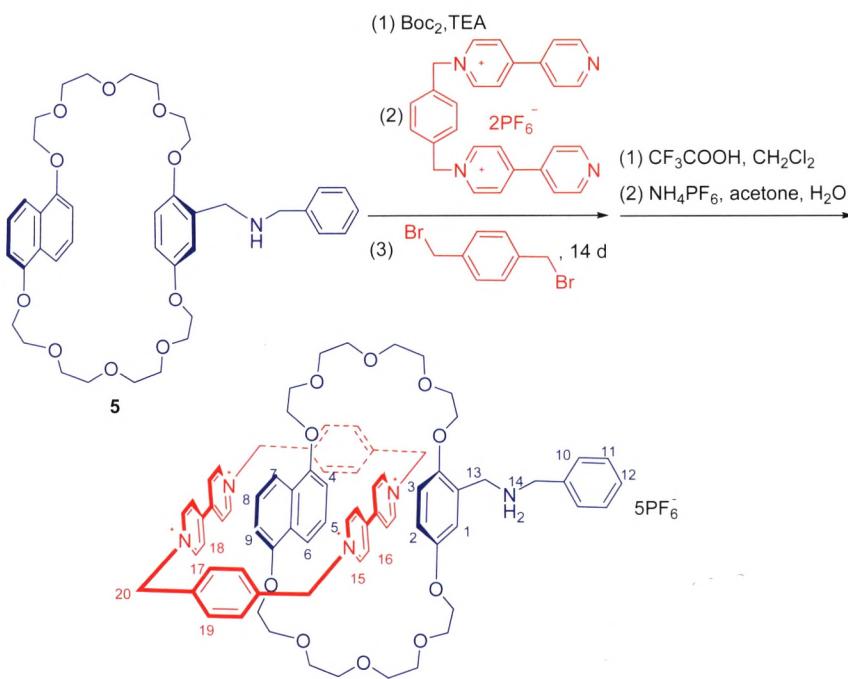
## Scandium(III)-Catalyzed Aza-Michael Addition of *in Situ* Generated *ortho*-Quinone Methides with Amines: An Efficient Access to Betti Base Derivatives

Three series of chalcones were synthesized and tested for the activity against five cell lines, MCF-7, A549, HL-60, Hela, and Bewo. The results showed that **4a**, **4e**, **4f**, **4j**, **4m**, and **4o** displayed the best inhibitory activity for MCF-7 breast cancer cells, A549, lung cancer cells, and HL-60 leukemia cancer cells with IC<sub>50</sub> values below 10  $\mu\text{mol/L}$ . The structures of the synthesized compounds were characterized by spectroscopic techniques.



Zhang, Shuo\*; Zhao, Ning; Li, Qinggang; Zhang, Jiaqi; Hou, Zitong; Liu, Yifan; Yu, Yitao; Peng, Dan\*; Wang, Feng; Li, Bing; Li, Jinhuai  
*Chin. J. Org. Chem.* **2019**, *39*(3), 709

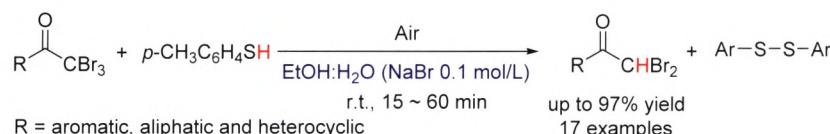
## Supramolecular Assembly Based on the Novel Sail-Boat-Shaped Self-Complexes



Zhang, Shilong; Jiang, Lasheng\*  
*Chin. J. Org. Chem.* **2019**, *39*(3), 720

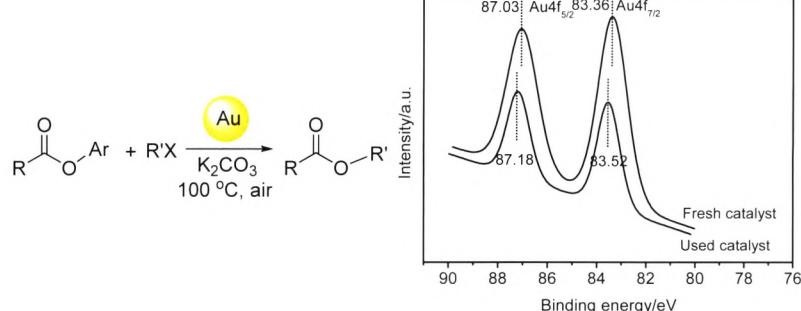
Owing to the unique macrocyclic-cavity structure of crown ether and the capability of complexing with guest molecules, our group successfully designed and synthesized a novel Sailboat-Shaped self-complex by using intramolecular hydrogen bonds, which are able to switch its configuration during the different pH value. Furthermore, a novel catenane which based on the sailboat-shaped self-complex was obtained by using intermolecular charge transfer interaction and through the template-directed method, and its structure was identified by <sup>1</sup>H NMR, <sup>13</sup>C NMR, HRMS and <sup>1</sup>H-<sup>1</sup>H NOESY.

**Research on Reduction of  $\alpha,\alpha,\alpha$ -Tribromomethyl Ketones via Thiophenol**



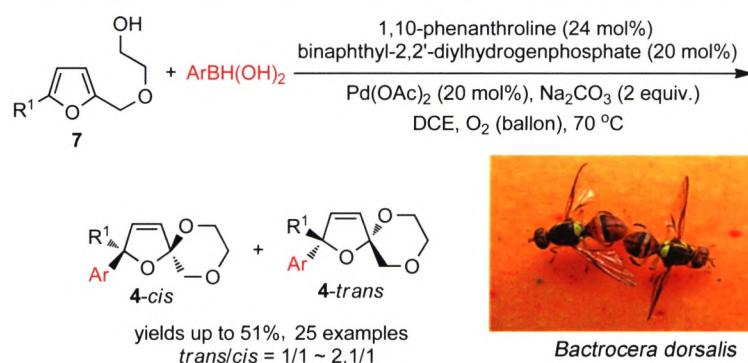
Yang, Ying; Balati, Hasimujiang; Abulikemu, Abudu Rexit\*  
*Chin. J. Org. Chem.* 2019, 39(3), 727

**Nano-Gold Catalyzed Transesterification of (Hetero)aryl Esters with Alkyl Halides via C—O Activation**



Ma, Hongpeng; Bai, Chaolumen; Bao, Yongsheng\*  
*Chin. J. Org. Chem.* 2019, 39(3), 734

**Synthesis, Biological Evaluation, and Structure-Activity Relationship Study of Unsaturated Spiroacetals as Potential Sex Attractants to Oriental Fruit Flies (*Bactrocera dorsalis*)**

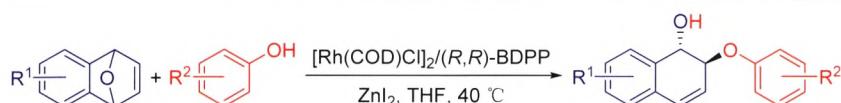


Li, Jiuyi; Chen, Li\*; Yin, Biaolin\*  
*Chin. J. Org. Chem.* 2019, 39(3), 747

**Asymmetric Ring Opening Reaction of Oxabenzonorbornadienes with Phenols Promoted by Rhodium/Zinc Complexes**

He, Zhenxiu; Zhou, Yongyun\*; Sun, Weiqing; Fan, Ruifeng; Shen, Guoli; Fan, Baomin\*  
*Chin. J. Org. Chem.* 2019, 39(3), 754

Two series of spiroacetals were synthesized and biologically evaluated as insect sex attractant towards oriental fruit flies (*Bactrocera dorsalis*) using methyleugenol as the standard. Biological evaluation demonstrated that a large part of the tested compounds triggered apparent electrophysiological responses from both male and female fruit flies. The stereochemistry of the spiroacetals and the substitution on their phenyl rings influenced the responses to some degree.



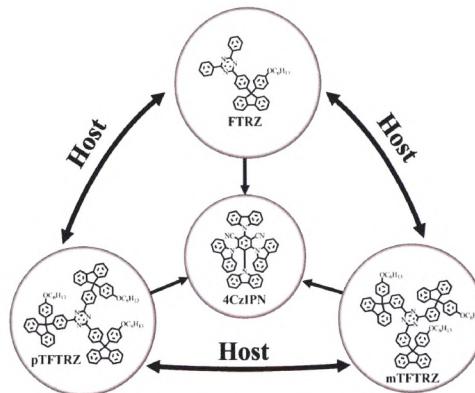
[Rh(COD)Cl]2/(R,R)-BDPP was used as an effective catalyst for the asymmetric ring opening reaction of oxabenzonorbornadienes with various phenols by employing ZnI2 as activator. Under the optimized reaction conditions, high enantioselectivities with good yields could be obtained from a wide scope of oxabenzonorbornadienes and phenols.

# CONTENT

## Synthesis and Applications of Excimer Host Materials Based on 2,4,6-Triphenyl-1,3,5-triazine and Fluorene Moieties

He, Xu; Xiao, Yuping; Yuan, Xinlei; Ye, Shanghui; Jiang, Hongji\*

*Chin. J. Org. Chem.* **2019**, *39*(3), 761

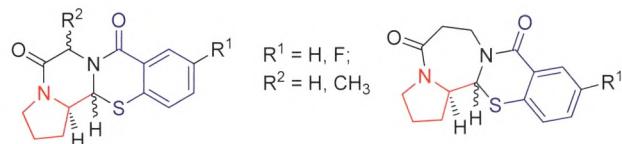


The Pd-catalyzed C—H functionalization reaction was used to synthesize 2,4,6-triphenyl-1,3,5-triazine and fluorene-based bipolar compounds, which showed great potential to be host materials for solution processable thermally activated delayed fluorescence organic light-emitting diodes (OLEDs).

## Synthesis of the Fused Tetracyclic Thiazinan-4-one Derivatives and Their Antitumor Activity

Niu, Liping; Xing, Shunkai; Li, Xiaoliu\*; Chen, Hua\*

*Chin. J. Org. Chem.* **2019**, *39*(3), 771

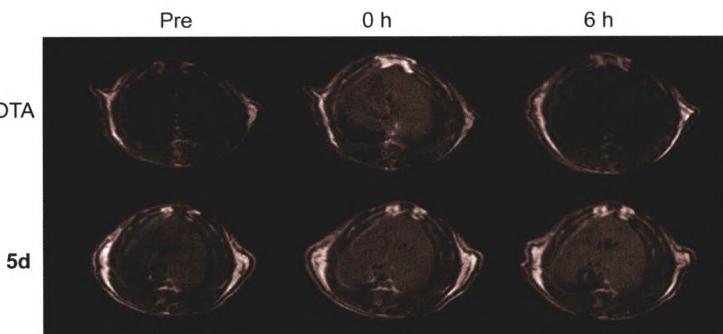


A series of the fused tetracyclic thiazinan-4-one derivatives were synthesized by three steps: the one-pot three-components condensation from the *N*-Boc-*L*-prolinal, amino acid ester hydrochlorides, and mercaptobenzoic acids, the removal of Boc, and the intramolecular cyclo-amidation reaction.

## Design, Synthesis and Evaluation of Novel Gd-Based 1,4,7,10-Tetraazacyclododecan-*N,N',N,N'*-tetraacetic Acid-Hydrazide Derived Contrast Agents for Magnetic Resonance Imaging

Sun, Hongshun\*; Zhou, Jin; Li, Yulong; Jiang, Hong; Zhang, Yan; Wang, Jianqiang; Guo, Cheng; Shen, Linjiang

*Chin. J. Org. Chem.* **2019**, *39*(3), 778

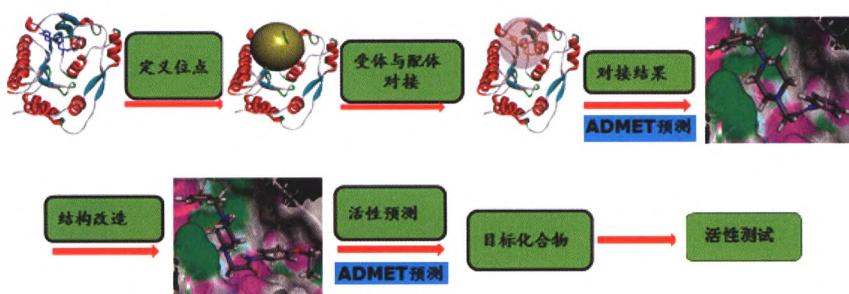


Twelve novel Gd-based 1,4,7,10-tetraazacyclododecan-*N,N',N,N'*-tetraacetic acid (DO-TA)-hydrazide derived contrast agents for magnetic resonance imaging (MRI), have been designed and synthesized. Among of them, **5d**, **5h** and **5l** exhibit higher longitudinal relaxivities than the clinical Gd-DOTA at 0.5 T. The relaxivities  $r_1$  of them are 4.67, 4.85 and 5.33 L $\cdot$ mmol $^{-1}\cdot$ s $^{-1}$ , respectively.

## Virtual Screening, Design, Synthesis and Biological Activity of Zika Virus Inhibitors

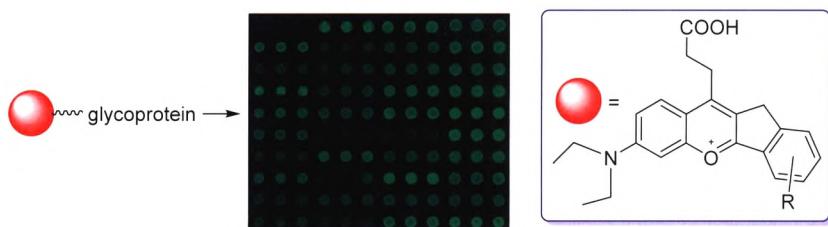
Li, Yanzhong; Qi, Sijia; Xu, Yanhao; Xia, Chengcui; Duan, Guiyun\*

*Chin. J. Org. Chem.* **2019**, *39*(3), 786



The 5M5B protein of Zika virus was used as receptor and made use of its binding site that has been defined to perform virtual screening with over 2 million small molecule compounds to get the leading compounds of anti-Zika virus. The present study is keen on the structural optimization, activity prediction, chemical synthesis and pharmacological activity for leading compounds.

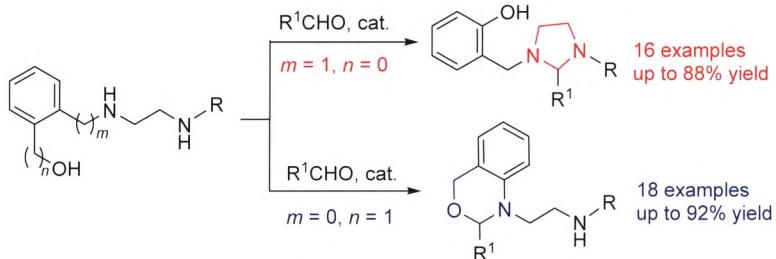
A Series of Red Dyes: Synthesis, Optical Properties and Application in Protein Labeling



Li, Huifang; Leng, Xin; Yan, Lirun; Yang, Bingqin\*; Bai, Yinjuan\*  
*Chin. J. Org. Chem.* 2019, 39(3), 793

Red fluorescent dyes are synthesized and characterized. Their optical properties and applications are discussed. Finally, the future applications of them are also prospected.

Chemoselective Synthesis of Substituted Benzoxazines and Imidazolidines by Reactions of Hydroxyl Substituted Ethylenediamine Derivatives with Aldehydes



Tang, Zilong\*; Wang, Ming; Yao, Yuan; Tan, Jingzhao; Dai, Ningning; Li, Xinxing; Peng, Lifen; Jiao, Yinchun  
*Chin. J. Org. Chem.* 2019, 39(3), 800

A series of novel functionalized imidazolidines and benzoxazines were synthesized by  $\text{La}(\text{OTf})_3$ -catalyzed chemoselective cyclizations of hydroxyl substituted ethylenediamine derivatives with aldehydes.

$\alpha$ -Oxygenation of Benzylic Ethers to Esters Using  $\text{MnO}_x\text{-N@C}$  Catalyst

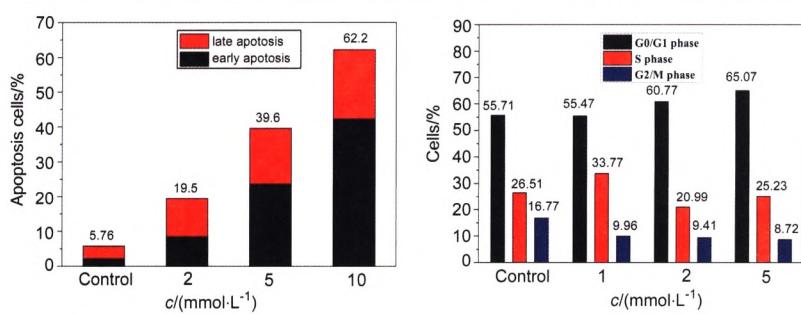


Liu, Jing; Wan, Cong; Zheng, Aili; Wang, Lianyue; Yin, Kaiyue; Liu, Dandan; Wang, Shengde; Ren, Lanhai\*; Gao, Shuang\*  
*Chin. J. Org. Chem.* 2019, 39(3), 811

A catalytic system for the oxidation of benzylic ethers to esters has been developed utilizing reusable  $\text{MnO}_x\text{-N@C}$  as catalyst and *tert*-butyl hydroperoxide (TBHP) as benign oxidant under neat condition. The catalytic oxidation system has good functional groups tolerance and excellent chemoselectivity, and this catalytic procedure can also be scaled up.

## NOTES

Synthesis and Antitumor Activity of Novel Isolongifolic-Alkyl Dihydropyrimidinethione Derivatives

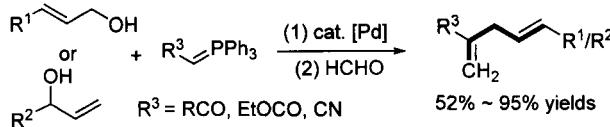


Ma, Chonghui; Wu, Chenliang; Wang, Yunyun; Huang, Zhenzhen; Zhang, Qiangjian; Dong, Fuhao; Gu, Wen; Shan, Yu\*; Wang, Shifa\*  
*Chin. J. Org. Chem.* 2019, 39(3), 821

Twelve dihydropyrimidinethione derivatives were synthesized and most of the derivatives showed considerable cytotoxic activity against three human cancer cell lines MDA-MB-231, HeLa and HepG-2. In addition, the cell cycle analysis showed that compound **3j** caused cell cycle arrest of MDA-MB-231 cells at G0/G1 phase. The Annexin V-EGFP/PI dual staining assay also revealed that compound **3j** induced the early apoptosis of MDA-MB-231 cells in a dose-dependent manner.

# CONTENT

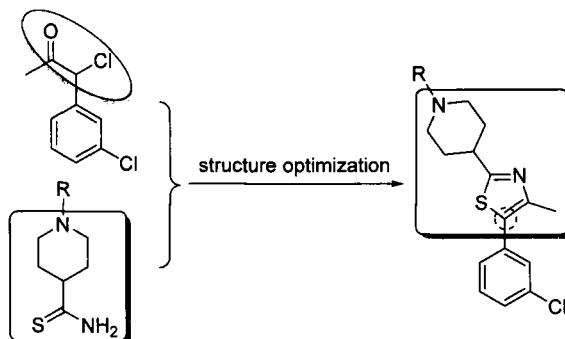
## Palladium-Catalyzed Dehydrative Cross Couplings of Stabilized Phosphorus Ylides with Allylic Alcohols



Ma, Xiantao\*; Yu, Jing; Ma, Ruitian; Yan, Ran; Zhang, Zhenlei\*  
*Chin. J. Org. Chem.* 2019, 39(3), 830

A dehydrative cross coupling of stabilized phosphorus ylides with the readily available allylic alcohols followed by a one-pot Wittig reaction is developed. A range of functional 1,4-dienes could be obtained in 52%~95% yields in the presence of 5 mol% Pd(PPh<sub>3</sub>)<sub>4</sub> and 20 mol% B(OH)<sub>3</sub>.

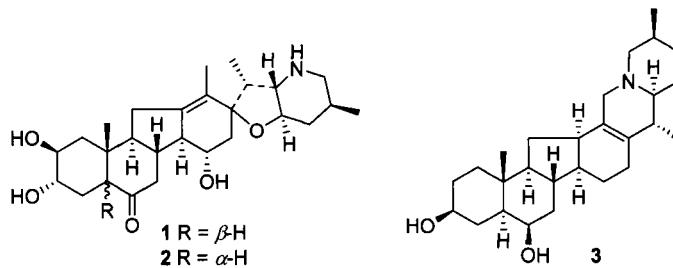
## Synthesis and Insecticidal Activity of Novel Piperidine Thiazole Compounds



Ding, Chengrong; Pan, Yayun; Yin, Xu; Tan, Chengxia\*; Zhang, Guofu\*  
*Chin. J. Org. Chem.* 2019, 39(3), 836

Twelve new pithiazole compounds were designed and synthesized in search of new bioactive compounds. The preliminary bioassay showed that the target compounds exhibited moderate to excellent insecticidal activities against armyworm.

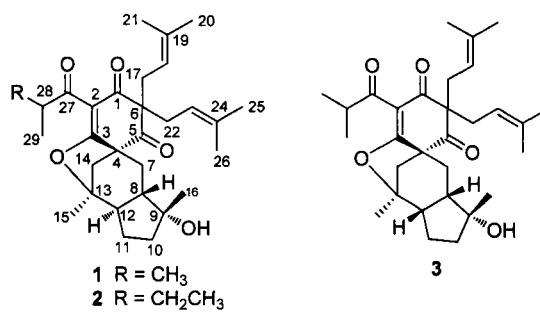
## Isosteroidal Alkaloids from *Fritillaria karelinii*



Huang, Jinchang; Lei, Chun; Aisa, Haji Akber; Yu, Meihua; Yili, Abulimiti\*; Hou, Ai-jun\*  
*Chin. J. Org. Chem.* 2019, 39(3), 842

Three new isosteroidal alkaloids, karelinine (1), 5-epikarelinine (2), and 27-epiebeienine (3), were isolated from the bulbs of *Fritillaria karelinii*. Compound 1 is a 5β-jervine isosteroidal alkaloid featuring a *cis*-fused A/B ring moiety, rarely found in the *Fritillaria* genus. Compounds 1 and 2 also represent the first jervine alkaloids with a 15α-hydroxy group from this genus.

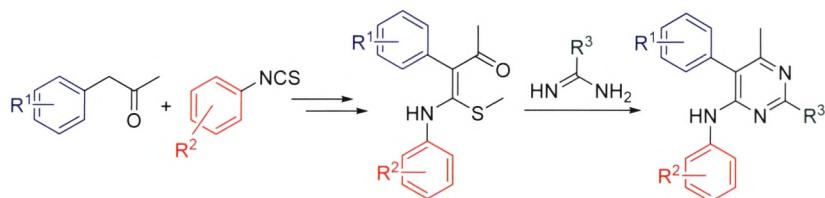
## Three New Polycyclic Polyprenylated Acylphloroglucinols from *Hypericum lagarocladium*



Wang, Kou\*; Wang, Yun; Wang, Ziming; Ding, Linfen; Hu, Jianlin; Chen, Jia\*  
*Chin. J. Org. Chem.* 2019, 39(3), 848

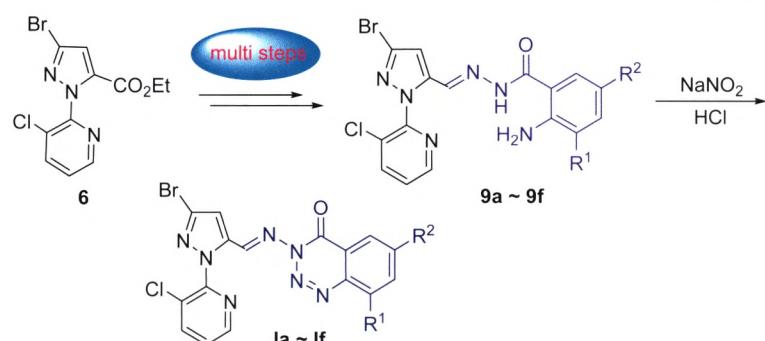
Three new polycyclic polyprenylated acylphloroglucinols (PPAPs) were isolated from *Hypericum lagarocladium*. Their structures were identified as hyperlagarin A (1), hyperlagarin B (2), and hyperlagarin C (3).

## Synthesis and Insecticidal Activity of Novel 4-Arylamino Pyrimidine Derivatives



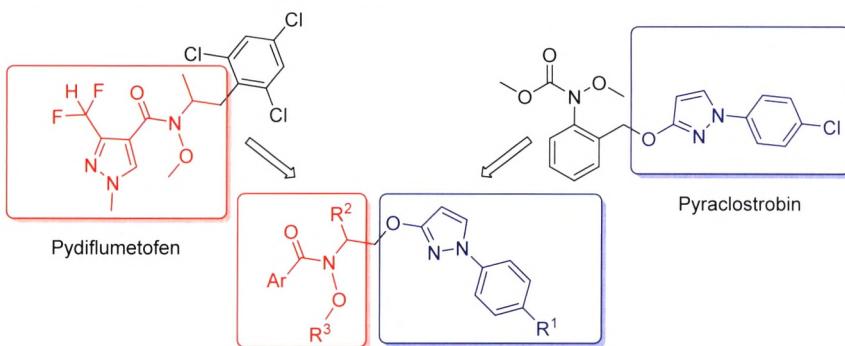
Wu, Ningjie; Cheng, Long; Wang, Jian; Yu, Jiping; Xing, Jiahua; Xu, Tianming; Wei, Youchang\*  
*Chin. J. Org. Chem.* 2019, 39(3), 852

## Synthesis and Biological Activities of Novel 3-((3-Bromo-1-(3-chloropyridin-2-yl)-1*H*-pyrazol-5-yl)methylene)amino)-substituted-benzo[*d*][1,2,3]triazin-4(3*H*)-ones



Zhang, Yan; Zhu, Hongwei; Shang, Junfeng; Wang, Baolei\*; Li, Zhengming\*  
*Chin. J. Org. Chem.* 2019, 39(3), 861

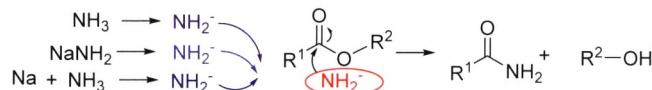
## Synthesis and Fungicidal Activity of *N*-Alkoxy Amide Derivatives



Huang, Pengmian\*; Zhou, Zhihui; Du, Yonglei; Pang, Huailin; Lü, Liang\*  
*Chin. J. Org. Chem.* 2019, 39(3), 867

## Efficient, Solvent-Free Aminolysis of Monoesters Catalyzed by Sodium

Shen, Tao; Ouyang, Bo; Zhou, Shaodong; Qian, Chao\*; Chen, Xinzhi  
*Chin. J. Org. Chem.* 2019, 39(3), 873



An efficient, solvent-free procedure using sodium as catalyst for the aminolysis of monoesters is reported. A detailed comparison of catalysts between sodium and sodium amide was made. Furthermore, this procedure was applied successfully for the aminolysis of other monoesters.

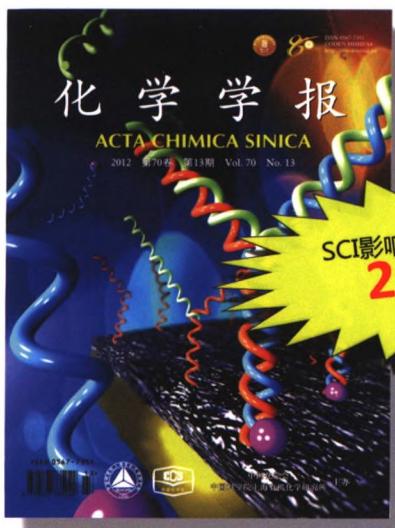
## HIGHLIGHTS

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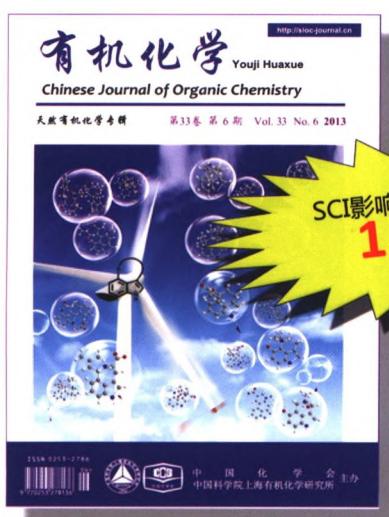
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