

Хабаров А.Г.

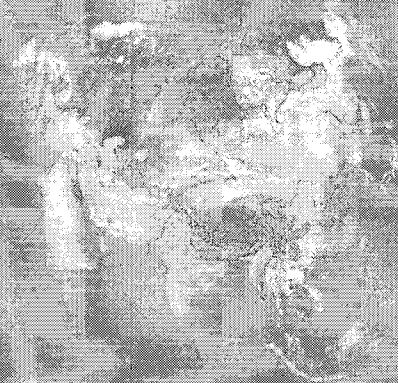
VOLUME 16

NUMBER 1

2014

ISSN 1562-3920

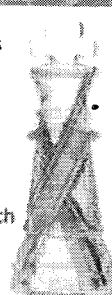
EURASIAN
CHEMICO-
TECHNOLOGICAL
JOURNAL



The International Higher Education
Academy of Sciences

This title
is indexed
in SciVerse
Scopus

Improving research
results through
analytical power



Eurasian Chemico-Technological Journal

Quarterly Journal of the International Higher Education Academy of Sciences

VOLUME 16

NUMBER 1

2014

Contents

O.V. Ivanova, S.A. Zelepugin, A.S. Yunoshev and V.V. Sil'vestrov Experimental and Numerical Research in Explosive Loading of Two- and Three-Component Solid Mixtures.....	3
K.S. Martirosyan, Z. Ramazanova and M. Zyskin Self-Heating Model of Spherical Aluminum Nanoparticle Oxidation	11
Z.A. Mansurov, N.N. Mofa, B.S. Sadykov and A.B. Shoibekova SH-Synthesis of Nanostructured Materials Based on $\text{SiO}_2\text{-Al-CaSiO}_3$ with Wollastonite after Ultrasonic Treatment	17
A.A. Saukhimov, M.A. Hobosyan, G.C. Dannangoda, N.N. Zhumabekova, S.E. Kumekov and K. S. Martirosyan Fabrication of Yttrium Ferrite Nanoparticles by Solution Combustion Synthesis	27
G.I. Ksandopulo The Efficiency of the Centrifuge is Force Action on the Propagation Mechanism of SHS-Wave	35
Yu. V. Titova, A. P. Amosov, G. V. Bichurov and D. A. Maidan Self-Propagating High-Temperature Synthesis of Silicon Carbide and Silicon Nitride Nanopowders Composition using Sodium Azide and Halides.....	41
G.I. Ksandopulo, A.N. Baideldinova, K.I. Omarova and A.M. Ainabayev Initiating Potential of Centrifugally Accelerated Metal Particles in the Inorganic Synthesis Reactions	49
A.Yu. Potanin, Yu.S. Pogozhev, E.A. Levashov, D.Yu. Kovalev, A.V. Novikov Features of Structural and Phase Transformations in Mo-Si-B and Cr-Al-Si-B Systems During Self-Propagating High-Temperature Synthesis.....	55
N.T. Danaev, A.N. Temirbekov and E.A. Malgazhdarov Modeling of Pollutants in the Atmosphere Based on Photochemical Reactions.....	61
A.K. Zeinidenov, N.Kh. Ibrayev and A.K. Aimukhanov The Laser Active Element Based on Dye on Porous Alumina.....	73
A.T. Khabiyeu and B.S. Selenova Palladium(II)-catalyzed Suzuki-Miyaura Reactions of Arylboronic Acid with Aryl Halide in the Presence of Aryl-Ferrocenyl-Phosphines	79
A.Ye. Malmakova, K.D. Praliyev, J.T. Welch, T.K. Iskakova and S.S. Ibraeva Synthesis of Novel 3,7-Diazabicyclo[3.3.1]nonane Derivatives.....	85

Palladium(II)-catalyzed Suzuki–Miyaura Reactions of Arylboronic Acid with Aryl Halide in the Presence of Aryl-Ferrocenyl-Phosphines

A.T. Khabiyev* and B.S. Selenova

Kazakh National Technical University named after K.I. Satpaev,
2 Satpaev str., 050013, Almaty, Kazakhstan

Abstract

This study examined investigation of catalytic activity of aryl-ferrocenyl-phosphine (2-methoxyphenyl-diferrocenyl phosphine (cat. 1), 2-tert-butyloxyphenyl diferrocenyl phosphine (cat. 2), 2-methoxynaphthyl diferrocenyl phosphine (cat. 3), 1,1'-bis(diphenylphosphino) ferrocene (cat. 4), phenyl diferrocenyl phosphine (cat. 5)) ligands with palladium salts as precursors in Suzuki–Miyaura reaction. Suzuki–Miyaura reaction is one of the important cross-coupling reactions and extremely powerful in forming C–C bonds. Aryl-ferrocenyl-phosphine ligands confer unprecedented activity for these processes, allowing reactions to be performed at low catalyst levels, to prepare extremely hindered biaryls and to be carried out, in general, also for reactions of aryl chlorides by temperature 100 °C and pressure 1 atm. Sterically demanding and strongly Lewis-basic ferrocene-based phosphines are water- and oxygen-resistant. The Suzuki–Miyaura reaction is also an important reaction in the ground and fine organic synthesis, in the production of drugs and intermediates. To analyze the conversion of halogen aryl compounds the ¹H NMR spectroscopy was used. The advantage of Suzuki–Miyaura reaction in comparison with other cross-coupling reactions (Kumada-, Heck-, Heck-Carbonylation-, Murahashi-, Sonogashira-, Negishi-, Stille-reaktion, etc.) is in the usage of low toxic, water- and oxygen-insensitive thermostable organoboron compounds. As boronic acid was used phenylboronic acid and as weak base – potassium phosphate. Catalyst, precursor and weak base were dissolved in toluene. All reactions were performed under an atmosphere of nitrogen or argon. The catalytic cycle of Suzuki–Miyaura reaction typically includes three main steps: oxidative addition of the haloaromatic to catalytic active palladium (0) species, transmetalation, and reductive elimination of the product under back formation of catalytically active species. All used catalysts showed good activity with aryl bromides and weak activity with aryl chlorides.

Keywords: ferrocene, palladium catalysts, C,C-cross-coupling reactions, Suzuki–Miyaura reaction, homogeneous catalyses.

Introduction

Recently palladium catalysts and C,C-cross-coupling reactions find application in synthesis of various chemicals in pharmaceutical and electronic industry, in petrochemistry, in generation of liquid crystals [1], solar cells [2], etc. An example of such application is large-scale production of 1-azano-4-methylbiphenyl [3] – an intermediate in the synthesis of antagonist angiotensin II [4], synthesis of liquid-crystal compounds [5], antibiotics, for instance vancomycin [6]. With these catalysts it is possible to construct large molecules from small. 2010 specialists from pharmaceutical company

GlaxoSmithKline (GSK) published a work, where they calculated, that 17% of all "medical" reactions are catalyzed by palladium catalysts [7]. It should be noted that not only heterogeneous catalysts are widely used in the chemical and petroleum industries, but also homogeneous metal complex catalysts. They characterized by high selectivity and enable to create cost-effective and environmentally friendly processes. In several cases homogeneous metal complex catalysts have significant advantages over homogeneous catalysts.

Among diverse C,C-cross-coupling reactions it is necessary to single out Suzuki–Miyaura reaction, representing a combination of aryl- or vinyl boronate

*Corresponding author. E-mail: alibek1324@mail.ru