

## Catalytic phosphorylation of aromatic C-H bonds

© Yulia H. Budnikova

Laboratory of Electrochemical Synthesis. Arbuzov Institute of Organic and Physical Chemistry of the Russian Academy of Sciences. A.E. Arbuzov St., 8. Kazan, 420088. Republic of Tatarstan. Russia.  
Fax: +7 (8432) 75-22-53. E-mail: [yulia@iopc.ru](mailto:yulia@iopc.ru)

**Keywords:** phosphorus-carbon bond, phosphorylation, catalysis, metal complex, green chemistry, carbon-hydrogen bond.

### Abstract

The development of ideal transformations to synthesize complex molecules that are effective, atom-economical and suitable for the environment is one of the most important problems of modern organic chemistry. Direct functionalization of carbon-hydrogen (C-H) bond is the most effective and low-waste way of transformation of molecules, which attracts a lot of attention to these reactions. Organophosphorous compounds with P-C bond can be found in a wide range of pharmaceuticals and medicinal chemistry, biochemistry, photoelectric materials, phosphine-containing ligands for catalysis and organic synthesis. Thus, the development of new and low-stage, effective methods of P-C bond formation is highly desirable and represents a significant challenge. This review describes recent advances in the development of strategies for the synthesis of practically important organophosphorus derivatives with phosphorus-carbon bond obtained directly by catalytic functionalization of the carbon-hydrogen bonds. The most important and promising areas of the last five years are highlighted, including the synthesis and properties arylphosphonate. Attention is drawn to the potential of this rapidly developing areas of organic and organoelemental chemistry.

### Content

1. Phosphorylation of benzene and substituted benzenes
2. Phosphorylation of heterocyclic aromatic compounds (triazoles, furans, pyrroles, etc.).
3. Reactions involving coumarins
4. The oxidative cyclization reaction of phosphine with acetylenes as a way to benzo[b]phosphole oxides
5. Phosphorylation of 2-isocyanobiphenyles
6. Phosphorylation-cyclization of alkinoates
7. Phosphorylation of phenylpyridine and its derivatives
8. Arylpalladium complexes as reactive intermediates in reactions of the C-P bond formation
9. Synthesis of 3-phosphoindoles by cross-coupling reaction with hydrogen evolution
10. Phosphorylation of benzamides
11. New ways of electrochemical formation of the C-P bond from C-H bond