New catalysts for cross-coupling reactions based on Pd(II) complexes with substituted isoxazoles and isothiazoles

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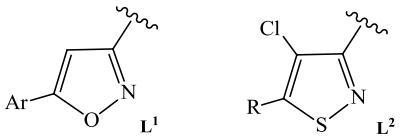
Pd(II) complexes are effective catalysts for cross-coupling reactions awarded the Nobel Prize in Chemistry in 2010. We have recently demonstrated that isoxazole (L^1) and isothiazole (L^2) derivatives can form complexes with palladium(II) exhibiting high catalytic activity in cross-coupling reactions in aqueous and aqueous-alcohol media (Green Chemistry) [1, 2].



Ar = C_6H_5, 4-MeC_6H_4, $Me_2C_6H_3$;
R = Cl, BnS

Immobilization of Pd(II) complexes on different carriers opens the path to refillable catalytic systems. In this work we carried out a targeted modification of isoxazoles and isothiasoles, synthesized their Pd(II) complexes, obtained catalytic systems on silica and carbon carriers and studied their catalytic activity in model cross-coupling reactions. We also synthesized activated esters of isoxazole and isothiazole series for conjugation with reactive polymers and obtaining catalysts on the polymer matrix. Obtained catalytic systems exhibited high catalytic activity in the model Suzuki reaction of 4-methoxyphenyl boronic acid with 3-bromobenzoic acid in aqueous and aqueous-methanol media. With the usage of 0.05–0.1 ml.% of the catalyst, the process was completed in 15–30 min and led to the target cross-coupling product with 93–100 % yield without formation of byproducts in case of some isothiazolic Pd(II) complexes. All tested azole-based Pd(II) catalytic systems were characterized by extremely low residual Pd contamination. The capabilities of new catalysts were demonstrated in the synthesis of nonsteroidal antiinflammatory drug Diflunisal.

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References

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2. N.A. Bumagin, S.K. Petkevitch, A.V. Kletskov et all. *Chem. Het. Comp.* (2014) 49 (10): 1515.