SYNLETT
Spotlight

This feature focuses on a reagent chosen by a postgraduate, highlighting the uses and preparation of the reagent in current research

Copper(II) Bromide

Compiled by Anton Makarov

Anton Makarov was born in Chelyabinsk, Russia in 1988. He received his B.Sc. and M.Sc. in pharmacy from Perm State Pharmaceutical Academy in 2010, and his M.Sc. in the field of organic chemistry from Perm State University in 2013. Currently, he is working toward his Ph.D. in organic chemistry at the same university under the supervision of Professor Alexander Butin. His research interests are focused on catalytic transformations of furan substrates.

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Dedicated to the memory of my father, Sergey Makarov, M.D.

Aliis inserviendo ipse consumor

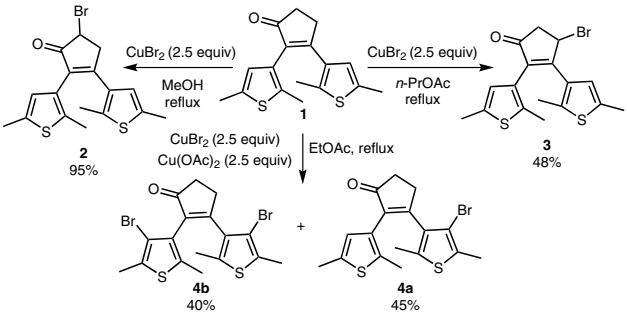
Introduction

Copper(II) bromide is a black crystalline powder with a melting point of 498 °C and a boiling point of 900 °C. It is soluble in water, alcohol and acetone; however, it is insoluble in benzene and ether. Copper(II) bromide can be obtained by the reaction of copper(II) oxide with hydrobromic acid or by the reaction of metallic copper with bromine.

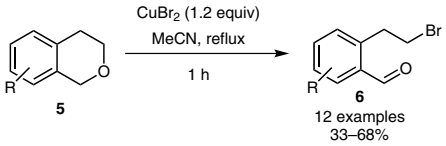
Copper(II) bromide is a powerful brominating agent.[1] It is also used as a catalyst in many organic reactions, including alkylation,[2] amination,[3] oxidation,[4] multi-component reactions,[5] and for the synthesis of ethers[6] or esters.[7]

Abstracts

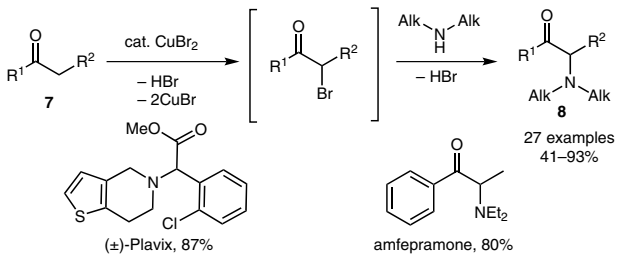
(A) Shirinian and co-workers developed a regio- and chemoselective method for the bromination of 2,3-diarylcyclopent-2-en-1-ones with copper(II) bromide. Different brominated products can be obtained depending on the reaction conditions utilized in case of 2,3-bis(2,5-dimethylthiophen-3-yl)cyclopent-2-enone (**1**). The formation of **2** and **3** is suggested to proceed via the reaction of in situ generated enolates with cationic Cu–Br species while **4a** and **4b** are formed by S_EAr.[8]



(B) Zhou et al. described a mild and efficient method for the oxidation–bromination of isochromans **5** to afford the corresponding 2-(2-bromoethyl)benzaldehydes **6**in one step with an excess of copper(II) bromide.[9]



(C) Recently, a green generic approach to complex α-amino carbonyls **8** via the $CuBr_2$-catalyzed coupling of carbonyls **7** and diverse secondary amines was described. The transformation is proposed to proceed via an α-bromo carbonyl species. The practical utility of this transformation was highlighted by one-step syntheses of two high–profile pharmaceutical agents, Plavix and amfepramone.[10]



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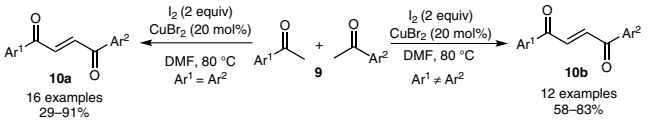
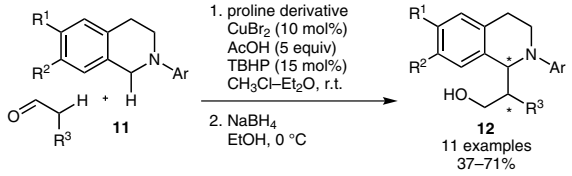
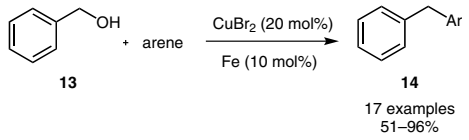
(D) Wang and co-workers reported a simple protocol for the synthesis of symmetric and unsymmetric (*E*)-2-ene-1,4-diones **10** by the reaction of acetophenones **9** with molecular iodine. The use of copper(II) bromide dramatically improved the yields of the desired products.[11]



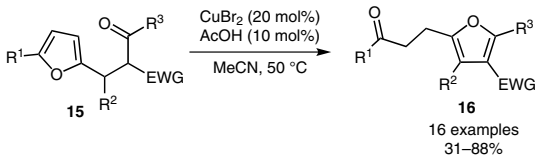
(E) Chi and co-workers reported a $CuBr_2$-catalyzed enantioselective oxidative cross-coupling reaction of tertiary amines **11** with aldehydes in the presence of a proline derivative as a chiral catalyst. The unstable aminoaldehydes were reduced in situ by sodium borohydride to afford γ-amino alcohols **12** with good enantioselectivity.[12]



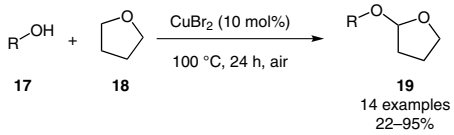
(F) An efficient and inexpensive Fe/$CuBr_2$-catalyzed benzylation of arenes and thiophenes under mild conditions was described. The method provides diarylmethanes **13** with good to excellent yields using the readily available benzyl alcohol **14** as a benzylating agent.[13]



(G) Yin and co-workers reported a mild method for the preparation of polysubstituted furans **16** via copper(II) bromide catalyzed rearrangement of furans **15**. This protocol provides an efficient access to tetrasubstituted furans, which are usually synthesized through multi-step procedures utilizing harsher reaction conditions.[14]



(H) Deng and co-workers developed a method for copper(II) bromide promoted tetrahydrofuranylation of alcohols **17** with unsubstituted tetrahydrofuran **18**. The protocol might be used for the protection of hydroxyl groups.[15]



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