Cyclization of 2′-Bromodeoxybenzoins: A New Synthesis of 2-Phenylbenzofurans

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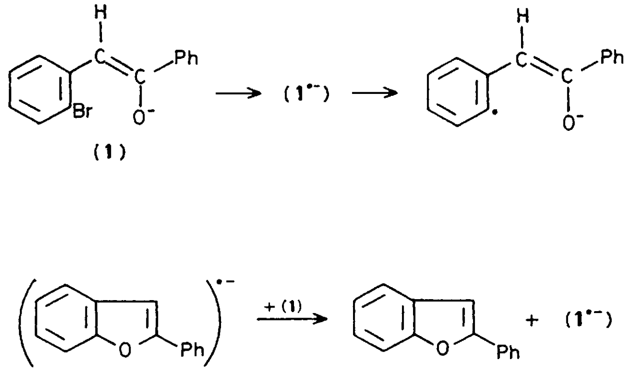
Reaction of 2′-bromodeoxybenzoins with copper powder in refluxing dimethylacetamide gives the corresponding 2-phenylfuran in good yields.

The $S_{RN}1$ reaction between aryl halides and certain nucleophiles can be carried out in liquid ammonia. A trace of alkali metal is used to generate the aryl halide radical-anion and so initiate the reaction sequence.[1] Successful reactions include intramolecular cyclization onto the carbon terminus of an enolate as the nucleophile.[2]

A number of hydroxy- and methoxy-substituted 2-phenylfurans are known to be phytoalexins with antifungal activity.[3,4] A possible route to their synthesis is illustrated by the intramolecular $S_{RN}1$ reaction of the enolate (**1**). An attempt to initiate this reaction using sodium in liquid ammonia, without exclusion of air, led to no cyclized product and only 2-bromobenzoic acid and benzoic acid could be isolated.

At higher temperatures the rate of carbon–bromine bond cleavage in the radical-anion from 2′-bromodeoxybenzoin increases so that electron transfer and bond cleavage become synchronous. A poor electron donor may then promote a satisfactory reaction rate.[5]

Reaction of 2′-bromodeoxybenzoin (**2**) with activated copper bronze in refluxing dimethylformamide gave the desired 2-phenylbenzofuran (**3**) after a lengthy reaction time. A more satisfactory solvent was dimethylacetamide at its boiling point. Examples of the reaction are given in Table 1. A combination of redox and radical cyclization processes is



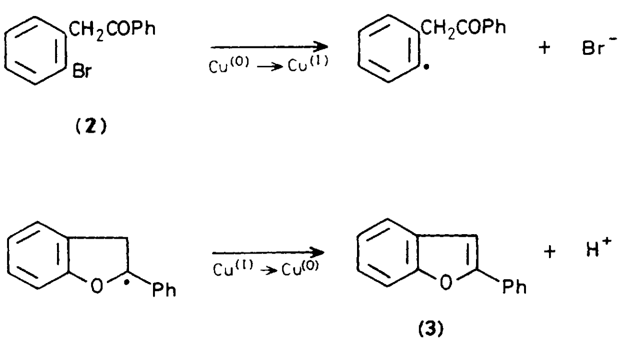


Table 1. Cyclization of 2′-bromodeoxybenzoins by copper bronze in refluxing dimethylacetamide for 48 h.

Reactant (**2**)	Product[a] (**3**)	Yield/%	m.p./°C
(**2**)	(**3**)[b]	70	120—122
3,4-dimethoxy-(**2**)	3′,4′-dimethoxy-(**3**)[c]	65	124—126
4′,5′-dimethoxy-(**2**)	5,6-dimethoxy-(**3**)	65	140—142

[a] Satisfactory analyses and expected spectral data were obtained. [b] Lit., m.p. 120—121 °C, ref. 6. [c] Lit., m.p. 127 °C, J. Astoin, P. Demeseman, A. Riveron, and R. Royer, *J. Heterocycl. Chem.*, 1977, **14**, 867.

suggested for the reaction mechanism, illustrated by the conversion of (**2**) into (**3**). Substituted 2-phenylbenzofurans have been prepared in the literature by acid catalysed cyclization of the appropriate 2′-hydroxy- or 2′-methoxy-deoxybenzoin.[4,6]

Copper and copper halide promoted cyclizations, related to this new process, are the conversion of 2-(2-iodophenyl)ethylamines into dihydroindoles[7] and the conversion of (*E*)-3-(3,4-dimethoxyphenyl)-2-nitrocinnamic acid into 3-(3,4-dimethoxyphenyl)coumarin.[8]

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