Flavins – not only cofactors but also versatile photocatalysts

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Photoexcitation allows chemical transformations that are not accessible by conventional methods. Use of visible light combined with a photocatalyst even improves classical photochemical methodologies avoiding side reactions of functionalities sensitive to UV light and making photochemistry available for most laboratories. Nowadays, photo-redox catalysis with organic photocatalysts is of a growing interest because of low costs of organic dyes and new reactions that they are able to mediate thus expanding the boundaries of organic synthesis [1].

Several organic dyes including simple aromatic heterocyclic compounds have been found to provide a certain type of transformations involving either photoreductive or photooxidative catalytic cycle. However, there is only limited number of photocatalysts, which are characterized by versatile reactivity [2]. Flavins (Figure 1), prominent natural chromophores, are characterized by several stable redox and excited states [3]. Additionally, three-ring flavin (isoalloxazine) structure offers great option to tune redox and photophysical properties. Thus, flavin-based photocatalysts are destined to drive a diverse range of chemical reactions. Among flavin derivatives, one can find ethylene-bridged flavinium salts **1**, behaving as strong oxidizing species [4]. On the other hand, an excited radical anion of 5-phenyldeazaflavin **2** is one of the strongest reducing species comparable with alkaline metals [5]. In the presentation, rational design of flavin-based photocatalytic systems and their application in aerial oxidations, C-H activations, and in photoreductions will be discussed.

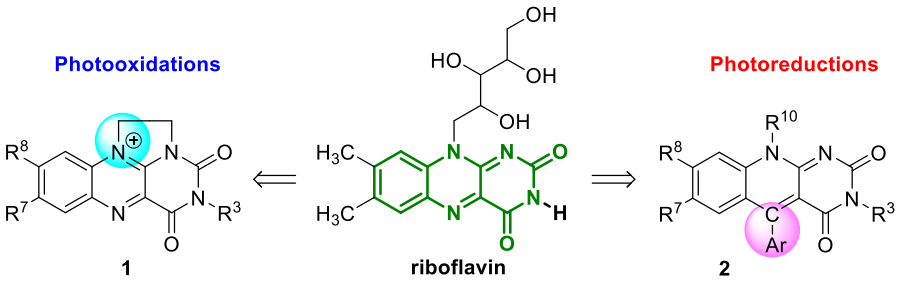

Figure 1. Riboflavin with highlighted isoalloxazine ring and flavin derivatives used in photoredox catalysis.

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