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Synthesis and photophysical properties of fluorescent purine derivatives

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Abstract

In this study we have introduced various substituents at C2 and C6 positions of purine to test their impact on fluorescent properties. Fluorescent purine derivatives have potential for use in materials science, cell imaging and study of DNA/RNA structures. Our initial attempts involved synthesis of compounds of type **A** and **B** which are characterized by push-pull fluorescence. Various azole groups were introduced as electron acceptors, mainly focusing on the use of 1,2,3-triazolyl moieties, while piperidine substituent was used as an electron donating group. Functionalization at N9 was done either with alkyl substituents either with or without bulky triphenylmethyl groups, which provided amorphousing properties for compounds, that are useful in materials science. Compounds of type **A** exhibited visible violet emission with moderate yields, while compounds of type **B** emitted blue light with yields over 90% in DCM solution and over 50% in thin layer film. Compounds of type **C** were synthesized to determine the influence of C-C connection between triazole and purine on stability and emissive properties in comparison with C-N analogues **B**. Compounds of type **C** were synthesized using Sonogashira coupling and subsequent CuAAC with different alkyl and aryl azides. However, differences in stability and emission between compounds **B** and **C** were negligible. Our latest research focuses on 6-cyanopurine derivatives **D**. Such compounds exhibit thermally activated delayed fluorescence and can form emissive exciplexes with carbazole derivatives. These compounds exhibit emission only in solid state and we are investigating effects of steric hindrance and substituent positioning on their photophysical properties.

The synthetic routes, structure diversity of modified purine derivatives and their photophysical properties will be discussed.

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