Synthesis, Characterization and Application of New 4-Hydroxy-1,3-thiazole Derivatives in Fluorescence Microscopy

Wiegand, Milena (School: Albert-Schweitzer-Gymnasium)
Asenow, Max (School: Albert-Schweitzer-Gymnasium)
Munkewitz, Tina (School: Albert-Schweitzer-Gymnasium)

Previous research has revealed the strong fluorescence of 4-Hydroxy-1,3-Thiazoles and enabled their various applications. However they have never been tested on their suitability in fluorescence microscopy. Due to the known affinity of the functional amino group for organic cell structures two new derivatives (amine, ammonium salt) based on the chromophor 5-phenyl-2-(pyridine-2-yl)-1,3-thiazole-4-ol have been synthesized according to Hantzsch, Williamson and Gabriel and henceforth been characterized by photometric methods in this project. Absorption and emission data recorded in different solvents showed a large Stokes shift and no significant solvatochromism. Furthermore a via acid concentration shiftable equilibrium between strong blue and weak green fluorescence was discovered. Given the planned application in fluorescence microscopy the fluorescent dyes were investigated on their resistance to photobleaching in various experiments. The measurement and calculation of the fluorescence quantum yields and their decrease revealed an acceptable stability against a photoinduced decay of fluorescence. To verify their ability to identify organic structures in living cells, Escherichia coli bacteria and HeLa-cells have been stained and examined under the fluorescence microscope. Owing to primary localization of the fluorophores to the cell pole in E. coli and a higher concentration of the thiazole-derivatives near the nucleus in HeLa-cells the dyes tendency for protein localization is assumed. An MTT assay showed that of the THP1 cells treated with a typical concentration of the agent in fluorescence microscopy, a rate of more than 80 percent could be detected after three hours of contact. This indicates a negligible impact on cell activity.

Awards Won: