The next generation of imaging standards for fluorescence microscopy

Jürgen J. Schmied[1], Max B. Scheible[1], Tim Schröder[2], Robert Neely[3], Philip Tinnefeld[2]

1. **GATTAquant GmbH, Am Schloßhof 8, 91355 Hiltpoltstein, Germany**
2. **LMU Munich, Butenandtstr. 5 – 13, 81377 Munich, Germany**
3. **University of Birmingham, School of Chemistry, B15 2TT Birmingham, UK**

E-mail: schmied@gattaquant.com

During the last years fluorescently labeled DNA origami nanostructures widely emerged as test samples for fluorescence microscopy and especially super-resolution (SR) microscopy.[1,2] The broadest application is shown for DNA-based nanorulers, which are utilized for testing the resolution of modern SR techniques like STED, SIM or localization-based techniques, for instance (d)STORM or DNA-PAINT. Beside that the DNA origami technique has been used to develop a new kind of fluorescent bead with superior properties in terms of brightness per volume as well as its homogeneity in size and brightness.[3]

In this talk we will present recent scientific developments to elaborate the next generation of DNA-based fluorescence standards. Therefore we demonstrate the ability to test the spatial resolution of super-resolution microscopes in all three dimensions using axial-oriented nanorulers.[4] Further we studied the minimum distance between two fluorescent dyes to avoid quenching effects and to achieve the highest brightness density per volume. These findings can for example further improve the brightness density of nanoscaled fluorescent beads. To label these beads we looked at alternative labeling methods, for instance using M.TaqI enzymes, to enable parallel and efficient labeling strategies.[5] Last but not least nanorulers are combined with the emerging technique of expansion microscopy to quantitatively determine the microscopic expansion factor inside the gel.[6]

References

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