Combining Light and Sound: Acoustogenic Probes for the Detection of Hypoxia and ALP Activity in Cancer

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Photoacoustic tomography (PAT), is an emerging imaging modality that is based on light-absorbing contrast agents that emit ultrasound upon radiationless relaxation. Since the scattering of sound in tissue is much less compared to light, this allows for deep tissue imaging with high spatial and axial resolution. Yet, the full potential of PAT is limited by the lack of turn-on probes that change their ultrasound emission characteristics upon interaction with specific analytes. In this work we present the development of acoustogenic probes for the detection of hypoxia and increased alkaline phosphatase (ALP) activity. Both conditions are characteristic for diverse forms cancer. The probes are based on newly developed dye platforms and corresponding reactive moieties. Upon interaction with their respective analytes, the probes experience either bathochromic or hyperchromic absorbance shifts that increase the intensity of the generated ultrasound signal. We envision that these novel contrast agents will allow for the early detection of cancer in deep tissues, which is a key for successful treatment.

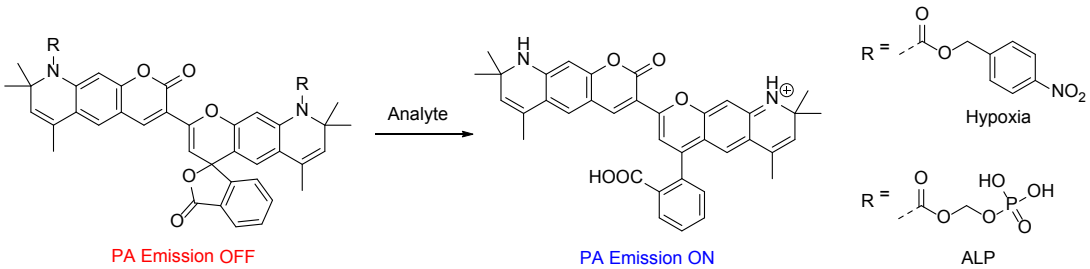

Figure 1: Structures of the hypoxia- and ALP-sensitive acoustogenic probes before and after activation of the photoacoustic (PA) emission.