SUPPLEMENTARY DATA

FIG. S1. (A) The principle of sensor excitation by the camera system, and (B) the technical set-up.
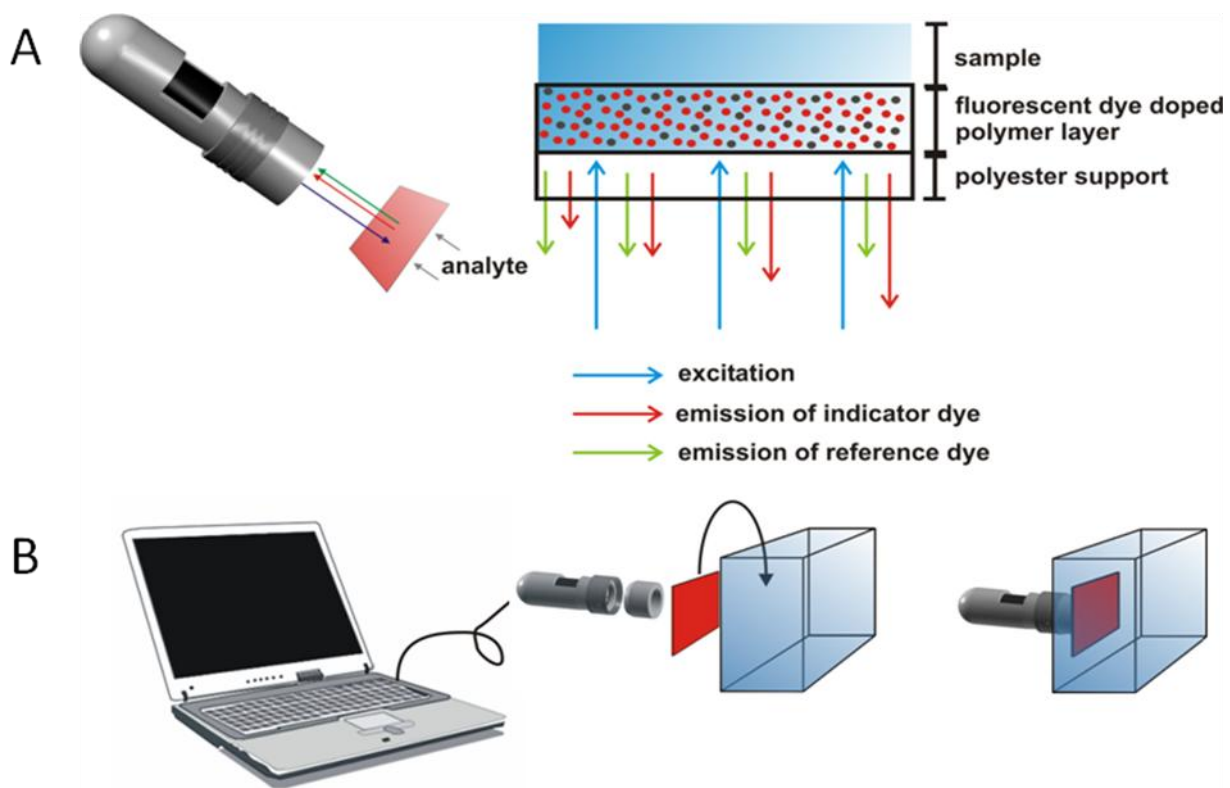
FIG. S2. Procedure for ratiometric image analysis. The original RGBimage is split into the red and green channels, and the ratio of the channels is displayed using false colours.

original RGB image

green channel

red channel

red / green
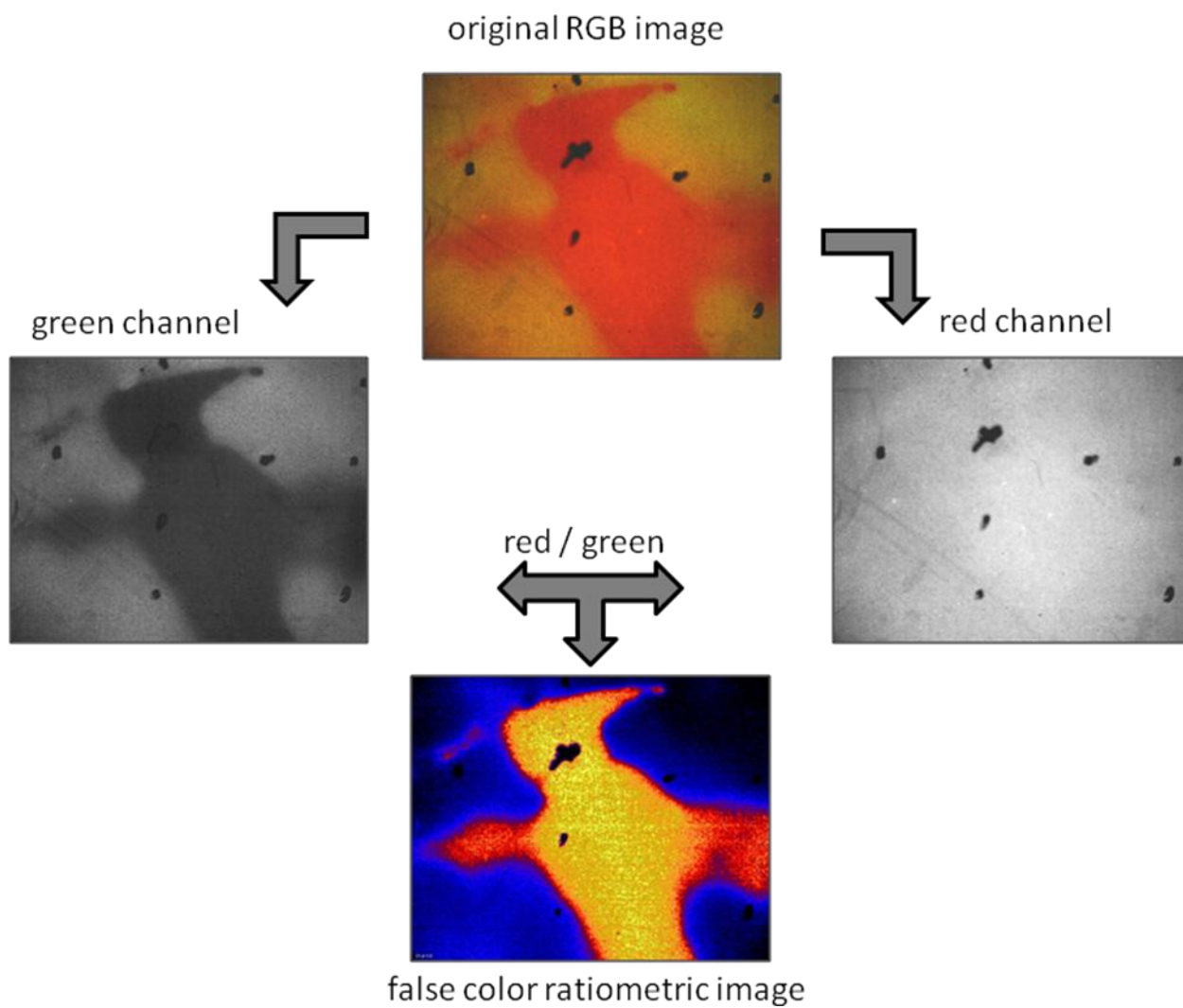
false color ratiometric image

FIG. S3. A typical calibration response of the pH sensor and the corresponding Boltzman fit for pH calculation.
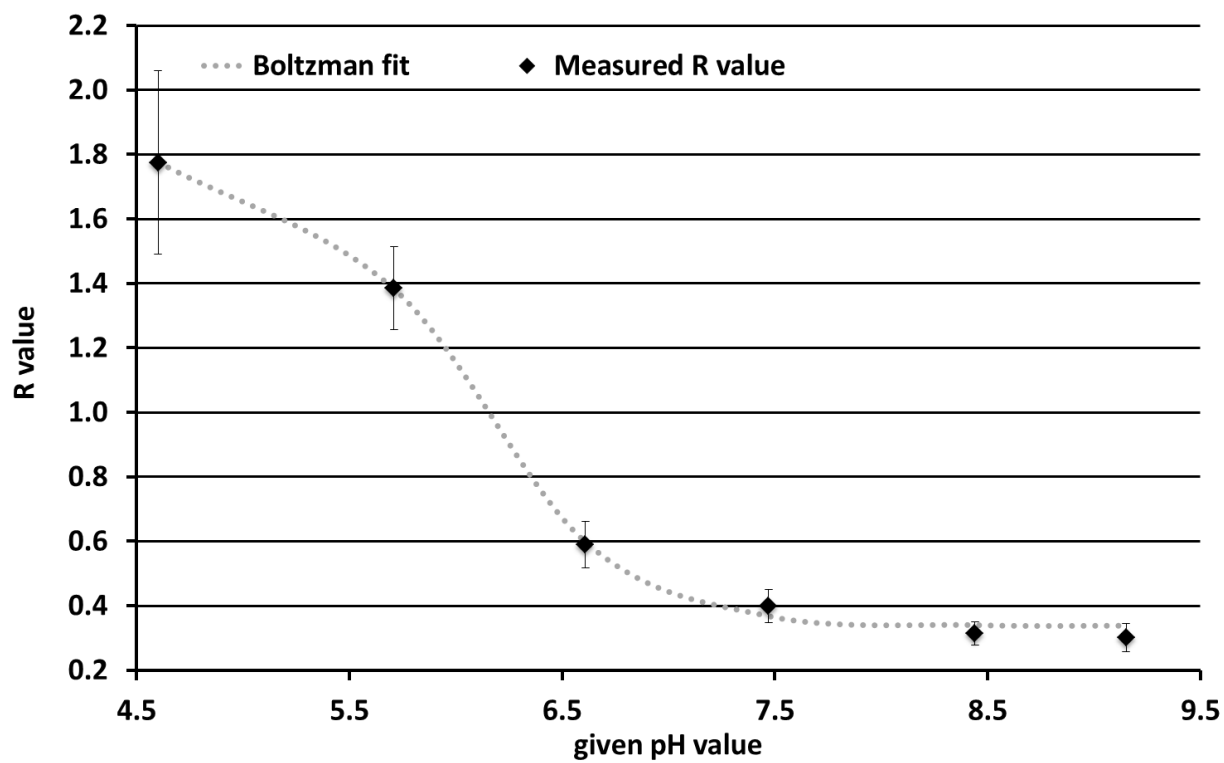
FIG. S4. A typical calibration response of the CO_2 sensor and the corresponding Boltzman fit for CO_2 calculation.