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Rapid field measurement of uranium in water samples

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We present an analytical method that allows for the rapid measurement of uranium in water samples. For a 50 ml sample concentrations down to about 2 micro-g/l can be measured within an hour. There are no toxic chemicals used and the whole equipment is portable and can be powered by a 12 V battery. The preparation consists of adding 200 mg silica gel to the 50 ml sample, stirring for 1 hour, filtering out the silica gel and transferring it to a semi-micro cuvette for the measurement. Several samples can be prepared in parallel, depending on the number of magnetic stirrers available. The measurement takes only 1 minute and uses the uranyl fluorescence, enhanced by the adsorption on silica gel. Excitation is done by a pulsed UV-LED at 285 nm. The delayed fluorescence signal around 520 nm is detected by a 6 mm x 6 mm Silicon Photomultiplier (SiPM) behind a 520 nm bandpass filter. Pulsing the LED, converting the SiPM output and displaying the result is controlled by an Arduino microprocessor. All details of the experimental setup as well the software code are presented. It's open source, open to be copied and the whole material costs are only around 500 Euro.