USE OF CATHODOLUMINESCENCE ANALYTICS ILLUSTRATED BY THE STABLE MINERAL GROUP MONAZITE-XENOTIME-ZIRCON FROM TRIASSIC SANDSTONES OF NE-BAVARIA

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Monazite, xenotime, and zircon in heavy mineral separates of siliciclastic sediments show similar optical properties but can easily be distinguished by means of cathodoluminescence (CL).

Within this stable group **zircon** is the most common mineral with three known luminescence colours: yellow, blue and violet (marshall, 1988). Besides, a white or a grey luminescence colour can occur very frequently. The white and grey luminescence colours are however only high and low intensity variations of the yellow and blue grains, respectively. In the CL-spectra of the examined zircons REE^{3+} primarily appear as activators. Four Dy^{3+}-narrow bands at 484 nm, 576 nm, 665 nm, and 757 nm are very characteristic, through which the first two are most strongly developed. Typical are smaller narrow bands at 480 nm, 545 nm, and 615 nm, which point out to an Eu^{2+}-Ion, Tb^{3+}-Ion and Eu^{3+}-Ion, respectively. Sm^{3+} forms three smaller narrow bands at 597 nm, 643 nm, and 703 nm. Blue luminescent zircons are characterized by a clearly developed band within the range of short-wave radiation. Within the spectra of yellow luminescent zircons the band in the short-wave region is usually missing. Additionally, another broad band occurs at 560 nm. Violet luminescent zircons show an increased intensity between 400 nm and 500 nm. Furthermore, Sm^{3+} is enriched compared with the otherwise dominating Dy^{3+}.

Xenotime shows a bottle-green CL-colour. Likewise to zircon, the emission bands of Dy^{3+} (484 nm, 576 nm, 665 nm, and 757 nm) dominate the CL-spectra of xenotime beside those of Tb^{3+} (480 nm and 545 nm) and Sm^{3+} (565 nm, 597 nm, 643 nm, and 703 nm). CL-spectra of xenotime are very similar to those of the blue zircons. The difference in colour can be explained by different intensities of the emission lines, which are strongly influenced by the crystal field and by the occurrence of intrinsic broad bands in zircons (Richter et al., 2006). These intrinsic bands between 400 nm and 500 nm are missing in the xenotime spectra.

Monazite appears to be non-luminescent, but shows a dull, very dark green colour. CL-spectra of monazite (Richter et al., in prep.) are very similar to those of the yellow zircons. Likewise to xenotime the intrinsic bands between 400 nm and 500 nm are missing. In addition, the characteristic band of Nd^{3+} appears between 850 nm and 920 nm. The Nd^{3+}-content in zircon and xenotime is commonly too low to be detected by CL-spectroscopy.

First quantitative investigations on heavy mineral separates of sandstones from the Middle Keuper and from the Lower Bunter of NE-Bavaria are carried out with the relatively simple CL-differentiation between monazite, xenotime, and zircon.

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