

## CHIME dating of detrital monazites from sandstones in the Upper Silesia Coal Basin, Poland

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The Upper Silesia Coal Basin, a large marine to non-marine sedimentary basin, covers an area of around 7400 square km in southwestern Poland and the northeastern Czech Republic. The coal-bearing rocks, 8500 m in thickness, are divided into 4 lithostratigraphic units: the Paralic Series, the Upper Silesia Sandstone Series, the Mudstone Series and the Krakow Sandstone Series. The Paralic Series features a conspicuous influence of periodic marine transgressions, and is assigned to the Namurian stage (Jureczka and Kotas, 1995). The uppermost Westphalian Krakow Sandstone Series is overlain by the Kwaczala Arkose. The latter lacks coal seams and contains silicified tree trunks identified as Dadoxylon, and is assigned to the Stephanian stage (Siedlecki, 1954).

Detrital monazite grains were separated from sandstones of the Paralic Series, the Krakow Sandstone Series and the Kwaczala Arkose. Five to six spots on individual grains were analyzed on EPMA for Th, U, Pb and Y, and X-ray intensities were converted into concentrations using an analytical data-set of natural monazite as the matrix composition.

Most of the 203 analyzed monazites from the Paralic Series have internally homogeneous apparent ages of 290-330, 440 and 530 Ma. Zoned grains fall into two groups: 290-330 Ma grains with cores of c. 500 Ma and 290-330 Ma grains with portions as young as 250 Ma along grain margins and/or cracks. Apparent ages younger than 280 Ma may be ascribed to partial reopening of the Th-U-Pb system after crystallization. Several grains show variation in Th and U concentrations and yield isochrons of c. 300 and 320 Ma. Monazite grains from the Krakow Sandstone Series cluster around 320 Ma, but distinctly younger (c. 290 Ma) and older (c. 500 Ma) grains are not uncommon. A total of 1589 spots on 318 monazite grains from the Kwaczala Arkose show apparent ages ranging from 290 to 500 Ma, and the proportion of c. 320 Ma ages is higher in this sample than in that from the Paralic Series. Lower Paleozoic ages are rare in this sample.

A surprising result is the large number of c. 300 Ma monazite grains throughout the stratigraphic profile. The 300 Ma ages point to the Stephanian stage of the Carboniferous period, and are inconsistent with the Namurian fauna age. It is possible that the monazites are older, and the Th-U-Pb systems were disturbed by post-sedimentary processes. The absence of petrological evidence for metamorphism or hydrothermal alteration in the sandstone samples, however, make this unlikely. A K-Ar age of 313.2 Ma from detrital muscovite in the upper part of the Paralic Series is distinctly younger than the fauna and stratigraphic age of 330 Ma (Banas et al., 1995). If this is the case, the stratigraphic age of the Paralic Series is slightly younger than has been thought.

The c. 300 Ma CHIME ages point to the Stephanian stage, and are consistent with the fauna and stratigraphic age for the Kwaczala Arkose. If these ages are taken as representing crystallization ages of the source rocks, rapid denudation of the crystalline source areas must have occurred. Crystalline rocks in the northeastern Bohemian Massif show CHIME monazite ages of  $298 \pm 22$  and  $292 \pm 6$  Ma (our unpublished data), and appear to be a likely source of detrital materials in the Upper Silesia Coal Basin, as has been suggested by Paszkowski et al. (1995).

References; \* Banas, M., Paszkowski, M. and Clauer, N. (1995): *Studia Geologica Polonica*, 108, 21-25.; \*Jureczka, J. and Kotas, A. (1995): In: Zdanowski A., Zakowa H. (editors) *The Carboniferous System in Poland*. Prace PIG, 148, 164-173.; \*Paszkowski, M., Jachowicz, M., Michalik, M., Teller, L., Uchman, A. and Urbanek, Z. (1995) *Studia Geologica Polonica*, 108, 45-127.; \*Siedlecki, S. (1954) *Biul. Inst. Geol.*, 73.