an increase in Ta and W from centre to rim of the crystals was detected. Moreover, upper greisen and albitite parts of the granite cupola are often enriched in Mn and Ta in comparison to the lower granite parts. Columbite-group minerals show atom. Ratio Mn /(Mn + Fe) = 0.06 – 0.85, Ta / (Ta + Nb) = 0.04 – 0.42; elevated W and Ti contents (up to 13 wt.% WO_3 and 7 wt.% TiO_2) are characteristic.

W-rich ixiolite represents a disordered columbite-group phase with 19–31 wt.% WO_3. The mineral forms strongly inhomogeneous, up to 0.3 mm large grains. W-rich columbite/ixiolite compositions are characteristic of tin-bearing rare-element granites as documented in the Cínovec granite cupola (Johan and Johan 1994).

A phase with stoichiometry analogous to qitianlingite (?), $(Fe,Mn)_2 (Nb,Ta)_2 WO_{10}$ (Yang et al. 1985), containing 32–39 wt.% WO_3, Mn /(Mn + Fe) = 0.26–0.39 and Ta /(Ta + Nb) = = 0.05–0.35, forms rare, max. 15 µm large probably exsolution lamellae in intergrowths with Wrich columbite/ixiolite and Nb,Ta-rich ferberite in Dlhá Dolina, Hnilec and Poproč Li-F or muscovite-topaz granites. However, the phase possibly represents a strongly W-rich columbite or ixiolite member (cf. Johan and Johan 1994).

Minerals of the wolframite series; ferberite, rarely hübnerite (Mn/(Mn + Fe) = 0.19–0.56), occur as platy crystals and fan aggregates, 0.1 mm to 2 cm in size, in Li-F granites and quartz veins in greisens. In some cases, ferberite is intergrown with other afore-mentioned W,Nb,Ta-rich phases and show increased Nb contents (7–22 wt.% Nb_2O_5), up to an intermediate phase between wolframite and columbite/ixiolite composition ("?-phase").

Niobian and tantalian rutile (ilmenorutile and strüverite) forms 30–50 µm anhedral, strongly zonal crystals in Li-F granites and albitites; it contains up to 7 wt % WO_3, 30 wt % Nb_2O_5 and 22 wt % Ta_2O_5; Ta/(Ta + Nb) = 0–0.58.

Cassiterite, the most common ore mineral of the mineralization, contains only up to 1.2 wt % Nb_2O_5 and 2.2 wt.% Ta_2O_5. Locally, tiny ferrocolumbite inclusions occur in cassiterite.

Microlite to uranmicrolite forms inhomogeneous subhedral grains, max. 0.2 mm large, in the Dlhá Valley albitites and greisens. Locally, it is rimmed by ferrocolumbite. Microlite contains 5–7 wt.% UO_2 and < 1 wt.% TiO_2, uranmicrolite shows 20-24 wt.% UO_2 and 5–9 wt.% TiO_2. For both species: Ca » Na (< 0.5 wt.% Na_2O) and Ta/(Ta + Nb) = 0.70–0.89.

A complex Y-HREE-Nb-Ta oxides, the most probably polycrase-(Y) and uranopolycrase were detected as up to 50 µm irregular grains in silicified phyllite and in quartz albitite vein from exocontact aureole of the Dlhá Valley granite. They contain 7–15 wt.% Y203, < 8 wt.% HREEZOa (mainly Dy and Yb), 12–23 (polycrase-(Y)) or 29–31 wt.% U_2O_2 (uranopolycrase), 18–29 wt.% TiO_2 and max. 5 wt.% WO_3; Ta /(Ta + Nb) = = 0–0.31.

References

GRECULA P. (Editor), 1995. Mineral deposits of the Slovak Ore Mountains. Vol. 1. Mineralia Slovaca Corp., Bratislava.

JOHAN V. and JOHAN Z., 1994. Accessory minerals of the Cínovec/Zinnwald granite cupola, Czech Republic. Part 1: Nb-, Ta- and Ti-bearing oxides. *Mineral. Petrol.*, 51: 323-343.

UHER P. and BROSKA I., 1996. Post-orogenic Permian granitic rocks in the Western Carpathian-Pannonian area: Geochemistry, mineralogy and evolution. Geol. *Carpath.*, 47: 311-321.

YANG G., WANG S., PENG Z. and BU J., 1985. Qitianlingite – A newly discovered superstructure complex oxide. *Acta Mineral. Sinica*, 5: 193-198 (also in *Am. Mineral.*, 1988, 73, 1497).

Depositional Systems and Sequence Stratigraphy of Coarse-Grained Deltas in a Shallow-Marine, Strike-Slip Setting: the Bohemian Cretaceous Basin, Czech Republic

David ULIČNÝ

Geophysical Institute, Czech Academy of Sciences, Boční II/1401, 141 31 Praha 4, Czech Republic

Coarse-grained, Gilbert-type deltas showing a varying degree of reworking of foresets by basinal currents, were the dominant depositional system in Bohemian Cretaceous Basin during the Turonian through Early Coniacian times. The progradation of the deltaic packages, earlier interpreted as large-scale subaqueous dunes, shelf ridges, or subaqueous fault-scarp "accumulation terraces", was controlled by high- and low-frequency, relative sea-level changes in a relatively slowly subsiding, intracontinental strike-slip basin. End-member types of the Bohemian Cretaceous coarse-grained deltas are deep-water deltas, characterized by thick (50–80 m) foreset packages with steep (10–30°) foresets, and shallow-water deltas, which deposited thin (less than 15 m) packages with foresets typically between 4 and 10°. The differences in thickness and foreset slope angle were controlled dominantly by the accommodation available during progradation. The depositional regime of the deltas was governed (i) by the fluvial input of abundant sand bedload, with a minor proportion of gravel, (ii) gravity flows caused most likely by liquefaction of the upper part of the unstable foreset slope, and (iii) by migration of sandy bedforms on the foreset slopes. The bedform migration was driven by unidirectional currents of possible tidal origin. Individual foreset packages represent systems tracts, or parts of systems tracts, of depositional sequences. A variety of stacking patterns of high-frequency sequences exist in the basin, caused by low-frequency relative sea-level changes as well as by local changes in sediment input. Because of generally low subsidence rates, fluvial or beach topset strata were not preserved in the cases studied. The absence of preserved fluvial facies, which has been one of the main arguments against the fluvio-deltaic origin of the sandstone bodies, is explained by erosion of the topsets during transgression and their reworking into coarse-grained lags of regional extent covering ravinement surfaces.