Abstract

In the Barito Basin of Borneo, there are extensive coal seams in the Miocene Warukin Formation. The net thickness of subbituminous C coal exceeds 100 m in the Tutupan mine. Three coal seams (from bottom to top: T110, T210, T300) were studied to explore the paleo-peat type and the factors controlling paleo-peat accumulation. The study is based on 93 coal and 7 non-coal samples, each representing a stratigraphic interval of 1 m. The samples were analyzed for ash yield, moisture, carbon and sulphur contents. All samples were analyzed using the Rock-Eval method and maceral analysis. Every second coal sample was used for detailed organic geochemical analysis.

The coal in the T110 (46 m thick) and T210 (24 m) seams are very low in ash and sulphur, suggesting peat formation in an ombrotrophic mire. Accumulation of seam T300 (24 m), which contains a higher amount of detrital minerals, is interpreted to have occurred in rheotrophic and ombrotrophic settings. *n*-Alkane and biomarker ratios indicate that accumulation of seam T110 began in a mire with a relatively high contribution of grassland vegetation. Apart from this early stage, angiosperms (including dipterocarps) dominated the forest swamp vegetation. The presence of gymnosperms, albeit at lesser extent, indicates that coal formation occurred in a kerapah (watershed) type peat. The geochemical data reveal a cyclic structure in the T110 and T210 seams, possibly controlled by climatic fluctuations. Five cycles were recognized in the T110 seam and three cycles in the T210 seam, each 6 to 13 m thick. Using accumulation rates of tropical peat in SE Asia and the compaction of low-rank coal, the duration of a single cycle was estimated to be 10.8 kyr (P10) to 61.1 kyr (P90), with a 50% probability that the true value is 22.7 kyr. A causal relationship between the climatic variability and the precession index (17–24 kyr) is suspected.

The maceral composition of the Tutupan coals is characterized by moderately high tissue preservation and low gelification, which is typical for tropical ombrotrophic mires. Huminite is the most important maceral group. Liptinite macerals (including resinite, cutinite, fluorinite and suberinite) are abundant, while inertinite macerals are rare. Funginite is one of the main inertinite macerals.