GONDWANA, ECONOMIC PHOSPHORITE, AND THE EVOLVING EARTH

PEIR K. PUFAHL

Earth & Environmental Science, Acadia University Wolfville, Nova Scotia, B4P 2R6, Canada
Email: peir.pufahl@acadiau.ca
Voice: 1.902.585.1858

Phosphorite is a biochemical sedimentary rock rich in phosphorus that is almost exclusively Phanerozoic in age. The amount of phosphorus generally exceeds 18 wt. % P2O5, but can be as high as 40 wt. %, making phosphorite an important fertilizer ore. Because phosphorite is often associated with oceanic upwelling, and therefore organic matter rich, it can also be an important hydrocarbon source rock. Apart from the economic value of phosphorite, it is the most significant long-term sink for the global phosphorus cycle. Some of the most profound secular variations in the cycling and deposition of phosphorus occurred during the amalgamation and breakup of Gondwana. In the early Paleozoic changing ocean chemistry linked to Gondwana amalgamation, the Cambrian Explosion of life, and climate change produced a global phosphogenic event that is recognized on nearly every continent. Eventual breakup in the Mesozoic positioned continents favorably for the accumulation of expansive, epeiric sea phosphorites. These phosphorite giants are the Earth's largest and contain approximately 50% of the world's phosphate reserve base. They were created when shelf currents hydraulically concentrated early phosphatic precipitates into granular beds. The thickest beds are amalgamated, tabular units recording changes in upwelling intensity and storm frequency through time. Understanding how phosphorites formed is increasingly important since depletion of known global phosphate reserves is estimated to occur within 30 to 40 years, posing a major threat to global food security.