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Laumontite and Heulandite-Clinoptilolite Pseudomorphous after Jurassic Gastropods from Ponganui, New Zealand

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ABSTRACT. At two rich fossil localities in Ponganui (eastern Port Waikato), zeolite-facies, mid-Jurassic metasandstones and metasiltstones of Murihiku Supergroup contain high-spired gastropods whose tests have been pseudomorphed by laumontite. Upper whorls of the spires are infilled by heulandite-clinoptilolite and laumontite, accompanied by minor potash-feldspar, quartz and pyrite. Body whorls are infilled by zeolitised rock matrix. Laumontite has low alkali and is closer to the ideal formula than other laumontites reported from metamorphic rocks of New Zealand. Dehydration of laumontite to leonhardite is indicated by x-ray diffraction: a = 14.75, b = 13.13, c = 7.57Å, ß = 111.84°. Thermal analysis of heulandite-clinoptilolite gives ambiguous results consistent with the transitional composition these crystals possess within this mineral series. The crystal chemistry and associations of both zeolites is in accord with genetic models proposed by Boles and Coombs for similar Murihiku metasedimentary zeolites.

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Zeolite facies metamorphism is widely developed in thick, Triassic to Jurassic Murihiku Supergroup sandstones and siltstones of both North and South Islands of New Zealand (Coombs, 1954, 1960; Coombs *et al.*, 1959; Boles, 1977; Boles & Coombs, 1975, 1977; Ballance *et al.*, 1981; Clark, 1982). Characteristic mineral assemblages in the metasediments are: i) heulandite-analcime-quartz typically found in the upper levels of the stratigraphic succession and correlated with probable depths of more than 1 km and less than 10 km; and ii) laumontite-albite-quartz-chlorite and quartz-albite-adularia occurring predominantly in the lower half of the column and correlated with at least 9 km and perhaps as much as 20 km depth.

Typically, the zeolite minerals have developed at the expense of volcanic glass shards. They also occur as replacements for detrital minerals, particularly plagioclase, and as cement, fine-grained matrix, joint fillings and veins. In places laumontite replaces fossil molluscs and brachiopods (Coombs, 1954; Boles & Coombs, 1977; Clark, 1982). At two localities in mid-Jurassic metasediments of the Port Waikato section, laumontite is found consistently replacing high-spired gastropod shells, whose upper whorls are infilled by laumontite and