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Occurrences and Origins of Gem Zircons in Eastern Australia

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ABSTRACT. In eastern Australia, zircons are common in alluvial deposits derived from Tertiary volcanic rocks. They are typically accompanied by corundum, pleonaste spinel and ilmenite ('the zircospilic association'). Although most occur in or near granite areas, fieldwork and dating confirm alkali basalts and some trachytes as their hosts; some even being found *in situ*. Most crystals show corrosion effects from their transporting magmas.

A wide range of zircon crystal habits suggests diverse but, as yet, unknown sources. Possibilities include: (a) accidental sources from syenitic intrusives, plutonic cumulates and pegmatites, and (b) cognate origins in fractionated basaltic magmas, particularly their felsic end members. Dry, peraluminous alkaline magmas may be responsible for most of the large zircons. Eight groups are described on their physical characteristics. Most are (101)-pyramid dominant forms with short prisms. Variations in the incidence of crystal types show trends that may record changes in magma composition as well as temperature profiles.

Felsic intrusions associated with Mesozoic and Cainozoic 'hot spot' trails form potential reservoirs to provide zircon xenocrysts in later basalts. The relative contribution of these to older Palaeozoic granitoid zircon sources is uncertain, pending detailed isotopic work.

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Alkali basalts containing megacrysts of zircon are reported from a few localities in eastern Australia (eg. Binns, 1969; Stephenson, 1976) and we report several new occurrences. They may be accompanied by corundum, pleonaste and ilmenite, comprising the 'zircospilic association' of Hollis (1984). Similar occurrences are known from the Eifel, West Germany (Dana, 1898) and Irving & Frey (1984) list other records from France, Scotland, Algeria, Madagascar, Nigeria and South-East Asia. A further record comes from Thailand (Vichit *et.al.*, 1978). Derived alluvial occurrences are widespread in eastern Australia (Fig.1) and some yield gem zircons. These can exceed fist size in the Anakie Gemfield, Queensland. Large zircons (over 2 mm) also occur in trachytes and trachytic pyroclastics at Blue Mountain, Victoria, and Elsmore Hill, New South Wales (Lishmund & Oakes, 1983). Although small zircons are often abundant in alkali granitic rocks, large zircons are very poorly represented by an unconfirmed pegmatite source near Rubyvale, Qld, and a syenite at Jingera, N.S.W.

Zircons derived from alkali volcanics generally show rounding and sometimes fine surface corrosion textures, clearly distinct from abrasion produced by subsequent alluvial transport. A few crystals are completely sharp and uncorroded. A range of origins is suggested, from cognate and in equilibrium with their host magmas to accidental, disequilibrium xenocrysts. Fission-track dating of alluvial zircons gives results consistent with local volcanic sources (Gleadow, *et.al.*, 1976; Yim, *et.al.*, 1984.)

Interest in sapphires has generally overshadowed the zircons, about which only passing references are made. This study outlines important occurrences of large