

ORIGIN OF GEM CORUNDUMS FROM BASALTIC FIELDS

¹SUTHERLAND, F.L. and ²SCHWARZ, D. ¹Australian Museum, Sydney, Australia; ²Gübelin Gem Laboratory, Lucerne, Switzerland.

Favoured basalt fields yield gem corundums among their xenocrystal offerings. They are recorded in 6 continental regions, within 15 countries and involve over 40 main basalt fields. The corundums commonly include 'magmatic' blue, green to yellow, colour-zoned sapphires and less commonly 'metamorphic' various coloured sapphires and ruby. Magmatic suites (60% of basalt fields) dominate over mixed magmatic/metamorphic suites (25%) and metamorphic suites (15%).

Magmatic sapphires contain diverse, but characteristic, mineral inclusions. Co-existing zircon yields uranium-lead isotope formation ages and presumably also the sapphire crystallisation ages. These ages are usually close to host basaltic eruption ages. Rare sapphire-bearing felspathic xenoliths suggest a coarse syenitic origin. Crystallisation of magmatic sapphires has been variously ascribed to mid-crustal carbonatitic-silicic hybrid melt interactions or to lower crust/mantle felsic melts. Low volume melting of hydrous mantle to produce such syenitic melts was proposed from zircon/basalt dating within Australian sapphire fields. Growth from buffered high pressure syenitic melts undergoing fugitive alkali carbonatitic volatile loss is supported by recent studies in Scotland.

Metamorphic sapphire and ruby suites incorporate mineral inclusions and trace element contents that indicate a range of metamorphic source assemblages. Rare corundum-bearing metamorphic xenoliths suggest contact metamorphic, aluminosilicate regional metamorphic and lower crust granulitic sources.

In eastern Australia, trace element contents in corundums sampled from a 3000km long basaltic tract differentiate corundums into several separate magmatic and metamorphic fields. A few corundum suites show intermediate geochemical characteristics between those of 'magmatic' and 'metamorphic' origin and their precise origin requires further study.