Oxygen isotopes for gem corundums, eastern Australian basalt fields: results and genetic implications.

F.L.SUTHERLAND[1], G.GIULIANI[2], A.E. FALLICK[3], AND G.B. WEBB[1]

[1] Geoscience, Australian Museum , 6 College Street, Sydney, NSW 2010, Australia
Email LIN.SUTHERLAND@AUSTMUS.GOV.AU

[2] Centre National de la Recherche Scientific, BP 20 54501, Vandoeuvre-Lès-Nancy, France
Email GIULIANI@CRPG.CNRS-NANCY.FR

[3] Isotope Geoscience Unit, Scottish Universities Environmental Research Centre, East Killride, Glasgow G75 0QF, Scotland, U.K.
Email T.FALLICK@SUERC.GLA.AC.UK

Oxygen isotopes are used as a tracer in interpreting the origin of gem corundums. Eastern Australia is well endowed with gem corundums derived as xenocrysts from many basalt fields. Oxygen isotopes from a range of sapphires and rubies from these fields (north to south) were measured to give $\delta^{18}O$ values using a laser-fluorination technique.

Results include:

Anakie, central Qld; magmatic sapphries; 4.9-5.7 mil%
New England, N.S.W.; magmatic sapphires; 4.7-5.3 mil%
Yarrowich, N.S.W; magmatic sapphires 5.3-5.4 mil%
Yarrowich, N.S.W.; metamorphic rubies; 3.6-3.9 mil%
Barrington, N.S.W.; magmatic sapphires; 4.6-5.8 mil%
Barrington, N.S.W., metamorphic rubies; 5.1-6.2 mil%
Cudgegong, NSW; metamorphic rubies; 4.0-5.4 mil%
Oberon, N.S.W.; magmatic sapphires; 4.6-5.7 mil%
Tumbarumba, N.S.W.; magmatic sapphires; 5.9 mil%
Tumbarumba, N.S.W.; metasomatic sapphires; 5.5 mil%
Tumbarumba, N.S.W.; metamorphic sapphires; 6.4 mil%.

These results and those for N.E. Tasmania magmatic sapphires (4.1-6.2 mil%) suggest several different oxidizing conditions for gem corundum crystallisation. The magmatic and metasomatic suites largely overlap ultramafic rock and mantle values suggesting relatively deep corundum origin. The metamorphic sapphire ruby suites range from granulitic values to ultramafic values suggesting a wider range of crystallising conditions.

The overlap in O isotope values between the magmatic sapphire and some metamorphic ruby suites is an unusual feature. The presence of ultramafic ophiolites within folded crustal sequences within these ruby areas may provide the explanation.