

Geochronology of zircon inclusions and their implications for the origin of gem corundum deposits

KHIN ZAW¹, F.L. SUTHERLAND², I.T. GRAHAM³, S. MEFFRE¹, KYAW THU⁴, B. MCGEE¹

¹*CODES ARC Centre of Excellence in Ore Deposits, University Tasmania, Hobart, Australia 7001, e-mail E-mail address: Khin.Zaw@utas.edu.au*

²*School of Natural Sciences, BCRI Campus, North Parramatta, University of Western Sydney, NSW 1797, Australia*

³*Biology, Environmental and Earth Sciences, University New South Wales, Sydney*

⁴*Geology Department, Yangon University, Yangon, Myanmar*

Sapphires and rubies mined from placer and primary deposits form an important economic gem resource. Many are xenocrysts from basaltic fields or from other sources. An age of corundum crystallization indicates their lithospheric origin. Zircon is the main syngenetic inclusion used for U-Pb geochronology, but other minerals can be used. Many models exist for corundum formation under basalt fields, and dating of embedded inclusions helps to constrain these models. Most dating so far is from the Australian-Asian basaltic gemfields on the West Pacific margin, but includes other areas, e.g. Rio Mayo placers, Colombia, S. America. This study summarises known U-Pb zircon inclusion ages in corundums, to assess their genesis: Weld River, Tasmania, magmatic sapphires (47 Ma), Tumbarumba, NSW, magmatic and metasomatic corundums (23 Ma, 23-48 Ma, 400 Ma), New England, NSW, magmatic corundums (33-53 Ma), Lava Plains, Qld, magmatic corundums (2.3-3.9 Ma), Khao Wau, Trat, Thailand, magmatic corundums (1-2 Ma), Ban Huai Sai, Laos, magmatic sapphires (1-2 Ma), Wenchang, China, magmatic corundums (4.7 Ma), Changle, China, magmatic corundums (16-17 Ma), Quay Chau, Vietnam, metamorphic-metasomatic rubies (54 Ma), Mogok, Myanmar, metamorphic-metasomatic rubies (31-32 Ma) and Rio Mayo, Colombia, metasomatic corundums (~10 Ma). Most magmatic sapphire zircons give ages close to or within eruptive ages of the host basalt fields. Mostly Late Cenozoic to Palaeogene (1-53 Ma) ages are recorded. This suggests such sapphires formed from salic melts linked to basalt generation. Rubies from basaltic placers rarely contain zircon, so have more conjectural ages. They have metamorphic features and are linked to mafic granulites, so are probably older than accompanying magmatic sapphires. Rubies with zircon inclusions from marble host rocks are dated from Myanmar and Vietnam (31-54 Ma), but these differ in genesis to ruby xenocrysts from Asian basalt fields. A metasomatic sapphire-ruby suite from Colombia, South America is dated with ~10 Ma and may be linked to fluid activity during Andean volcanism.

Keywords: Rubies, Sapphires, Zircon, U Pb Geochronology, Myanmar, Vietnam, Australia