Trace element compositional continuum of Australian sapphire and ruby

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East Australian sapphire and ruby are found dominantly in alluvial gemfields that are spatially associated with Cenozoic alkali basalts. Previous work suggests that the gemstones were transported to the surface as xenocrysts within the basalts, implying that the compositions of sapphire and ruby may provide insight into processes occurring in the deep crust or mantle. Trace element ratios, such as Cr/Ga and Ga/Mg, have previously been used to distinguish between two major types of corundum found in eastern Australia, 'magmatic' and 'metamorphic,' that potentially correspond with mantle and crustal derivation, respectively. We measured trace element compositions of east Australian corundum to test the utility of previous classification systems and formulate new models for basalt-related sapphire and ruby occurrences. In contrast to previous studies that found clear distinctions between 'magmatic' and 'metamorphic' corundum, our new LA-ICP-MS data illustrate that key trace element ratios, including Cr/Ga and Ga/Mg, fall along a continuum. This finding suggests complex processes involved in the formation of sapphire and ruby, as opposed to clear distinctions between magmatic and metamorphic processes. We suggest that the compositional continuum arises from either differentiation of a single Al-rich magma, or mixing between magmas with distinct compositions.