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RESEARCH ARTICLE

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Disambiguation of pyrope-rich garnet inclusions in coloured sapphires from Tanzania and identification of other inclusions by Raman spectroscopy

Stefanos Karampelas[1] | **Ugo Hennebois**[1] | **Danilo Bersani**[2] | **Aurélien Delaunay**[1] | **Emmanuel Fritsch**[3]

[1]Laboratoire Français de Gemmologie (LFG), Paris, France

[2]Department of Mathematical, Physical and Computer Sciences, University of Parma, Parma, Italy

[3]Nantes Université, CNRS, Institut des Matériaux de Nantes Jean Rouxel, IMN, Nantes, France

Correspondence
Stefanos Karampelas, Laboratoire Français de Gemmologie (LFG), 30 rue de la Victoire, 75009 Paris, France.
Email: s.karampelas@lfg.paris

Abstract

Study of inclusions in gems from secondary deposits can give valuable clues on the geologic (and sometimes geographic) origin of these displaced materials. For the present study, seven gem quality fancy-coloured sapphires from Songea, Tanzania, were selected with, rarely observed in these gems, garnet inclusions in order to better understand their formation. Therefore, Raman spectroscopy was used to study garnet, as well as rutile, aluminosilicate and mica inclusions. Garnet composition calculations were made using the MIRAGEM Raman spectra software, which was further improved for the purpose of this study. A couple of garnet inclusions were also analysed by energy dispersive X-ray spectroscopy (EDS) attached to a scanning electron microscope (SEM). All garnet inclusions presented similar Raman spectra, thus similar chemical composition. Chemical analysis demonstrates that these are pyrope-rich (>40%) garnets with over 30% of almandine and over 20% grossular without any detectable titanium, chromium and sodium. Calculations made using the updated/improved MIRAGEM software were able to indicate the same composition as compatible with the obtained chemical analyses. Muscovite and sillimanite were also identified using micro-Raman spectroscopy. This inclusion scene is not similar to those described in fancy-coloured gem sapphires from other localities. The exact geological formation of these gems is yet not understood but might be eclogite or upper mantle related.

KEYWORDS

corundum, fancy-coloured sapphire, garnet, inclusion, pyrope

1 | INTRODUCTION

Coloured sapphires are called fancy-coloured sapphires and need the colour prefix, for example, pink sapphire sapphire. Fancy-coloured sapphires of gem quality are rare, and they are principally found in secondary placer deposits; indeed, these are found seldom in situ and only in a few types of primary host rocks.[1] Research on