Pink axinite from Merelani, Tanzania: a natural luminescent mineral irradiated in the Neoproterozoic Mozambique Metamorphic Belt

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Associated with an intense geological event from - 820 to - 520 My, East Africa was the place of major metamorphism. It yielded several mineral resources including high-quality gemstones. Those treasures are markers of the geological conditions during their formation. A relatively common mineral -axinite- is found in Merelani (Tanzania) with a rare undocumented pink colour of mysterious origin with an uncommon orange luminescence. We have characterized two extremely rare “pink” axinites from the famous Merelani deposit with classical gemological methods, energy-dispersive analysis on a scanning electron microscope, UV-Visible, Raman and luminescence spectroscopies. We compared the two pink samples to three other crystals from Merelani and one axinite-(Fe) from Oisans (France). Chemical analysis revealed the two pink axinites corresponded to axinite-(Mg). The pink to purple colour is due to a large broad band centred around 550 - 560 nm. Its position and shape are typical for Mn^{3+}. Manganese is present in both pink samples as Mn^{2+}, and we surmise that radiation from nearby minerals or rocks converted some Mn^{2+} into Mn^{3+}. The orange luminescence -weaker under shortwave ultraviolet- of the six axinites is related to a broad emission band at 631 nm caused by Mn^{2+} and the more unusual red luminescence is associated with two sharp peaks at 688 and 694 nm attributed to Cr^{3+}. This unique mineralization expands our knowledge of the impact of local lithology on gemstone colour.