# Orange luminescence of corundum as a source of geologic information? 

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Several defects are known in corundum. They can be extrinsic (impurities) or intrinsic (linked to the alumina structure). Some of these defects are generically called "Fcenters", they represent oxygen vacancies sometimes filled with electrons: the neutral variety is $\mathrm{F}^{2+}$ (those with one and two electrons are respectively $\mathrm{F}^{+}$and F -center). Often, these defects are trapped on chemical impurities such as $\mathrm{Cr}^{3+}, \mathrm{V}^{3+}$ or $\mathrm{Fe}^{3+}$.
The present work links the orange luminescence of corundum to intrinsic F-centers, We present here some absorption and emission/excitation spectra from different types of corundum (natural coloured or not, chemically and thermally treated and synthetics). These defects may form in different ways (thermochemical treatment or irradiation) or to compensate for the presence of a divalent cation (such as $\mathrm{Mg}^{2+}, \mathrm{Ca}^{2+}, \mathrm{Be}^{2+}$ present at ppm concentration) substituting for $\mathrm{Al}^{3+}$.

Orange luminescence of corundum is related to the presence of a divalent cation linked to an aggregate of two F-centers called $\mathrm{F}_{2}$-center ( $\mathrm{F}_{2}{ }^{2+}, \mathrm{F}_{2}{ }^{+}, \mathrm{F}_{2}$-center according to the number of electrons). The formation of these clusters of vacancies was studied and results from the agglomeration of simple vacancies in a range of temperature from 250 to $600^{\circ} \mathrm{C}$ [1]. Moreover, complex centers (divalent ion linked to vacancy) are formed in an oxidizing environment at high temperatures [2].
Thus, this preliminary work suggests using the orange luminescence of corundum as a potential thermogeological tracer of corundum growth in an oxidizing system.
[1] Atobe, Nishimoto \& Nakagawa (1985), Physica status solidi (a), 89(1), 155-162.
[2] Tardío, Ramírez \& González (2003), Applied physics letters, 83(5), 881-883.

