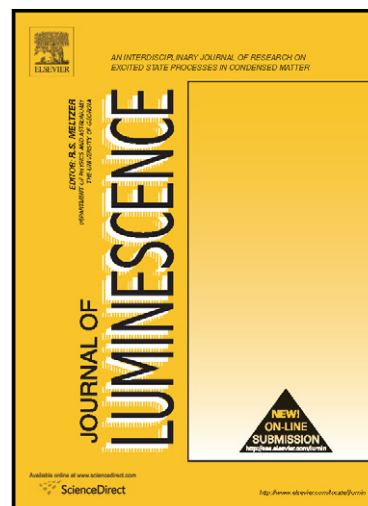


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# Fracto-mechanoluminescence from ruby and Cr doped spinel in cutting, grinding and polishing processes

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## Abstract

Red colored bright visible light fracto-mechanoluminescence was observed successfully from ruby (Cr doped  $\text{Al}_2\text{O}_3$ ) and Cr doped spinel (Cr doped  $\text{MgAl}_2\text{O}_4$ ) crystals in mechanical processes such as cutting, grinding and polishing. Fracto-mechanoluminescence spectra from ruby (peaking at  $\lambda=696$  nm) and Cr doped spinel (peaking at  $\lambda=693$  nm) perfectly agree with those of photoluminescence (PL) from  $\text{Cr}^{3+}$  ions in ruby and spinel crystals, respectively. In the grinding and polishing processes, peak intensities and peak wavelength of fracto-mechanoluminescence from ruby and Cr doped spinel crystals varies with roughness (grain size, #) of the diamond disk. Fracto-mechanoluminescence is expected to be used in the in-situ evaluation of fracture of crystals in cutting, grinding and polishing for highly precise mechanical processes.

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