Persistent phosphors under pressure

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The phenomenon of mechanoluminescence is closely related to ability of phosphors to store energy in their lattice. Therefore, it is a good approach to first focus on the trapping and detrapping mechanisms in persistent phosphors, before heading into the topic of mechanoluminescent materials and their range of promising applications[1-3].

Although from a distance persistent luminescence appears as a fairly simple process, characterized by the slow emission of light after ending the excitation, the relevant processes of trapping and detrapping are of a rather complex nature. These processes, including an often ignored optically stimulated deptrapping route[4], are illustrated for two benchmark persistent phosphors, $SrAl_2O_4$:Eu,Ln and $Sr_2MgSi_2O_7$:Eu,Dy[5-6].

In the second part of this presentation, we discuss the consequences of disturbing the persistent luminescence process by applying pressure. We focus on the mechanoluminescence processes in $BaSi_2O_2N_2$:Eu, a phosphor showing an interesting elasticolumiscent behavior and a clear response to ultrasound radiation pressure fields[7-8]. The role of the trap depth distribution present in this material is carefully analyzed to understand the combined persistent and mechanoluminescent response. Finally, the prospects of novel ML analysis and detection procedures are explored.

Reference:

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