Mechanoluminescence visualization of mechanical behavior at adhesive joint toward smart evaluation, design and prediction

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Mechanoluminescent (ML) material is a novel functional ceramic powder (most efficient ML material: $SrAl_2O_4:Eu^{2+}$) and it can emit intensive light repeatedly accompanied by mechanical stress. The ML intensity is proportional to strain energy of the material.[1–3] Thus, when dispersedly coated onto a structure, each particle acts as a sensitive mechanical sensor, while the two-dimensional (2D) emission pattern of the whole assembly reflects the dynamical strain/stress distribution (Fig. 1). Especially, high ML intensity appears at crack tip because of high strain concentration, and this makes ML method fascinating new tool to monitor crack propagation during adhesive evaluation (Fig. 2). Therefore, I will discuss usability of this new method to understanding mechanical behavior at adhesive joint toward smart evaluation, design, and prediction.

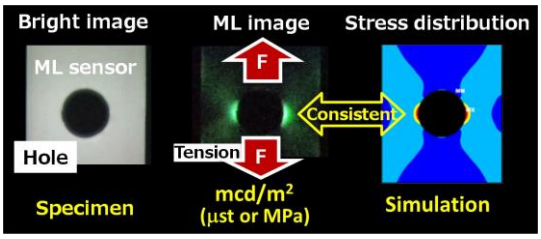

Fig. 1. Feature of ML sensor.

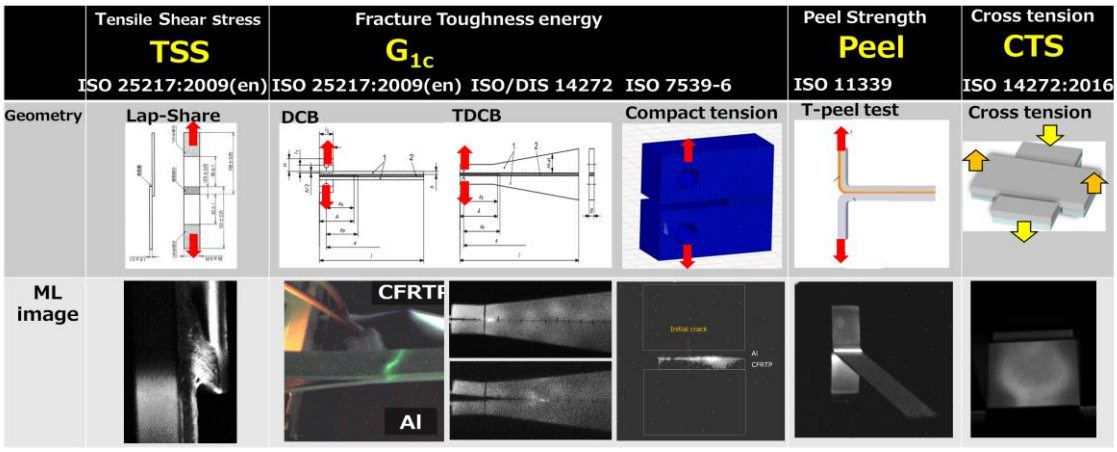

Fig. 2. ML application for visualising mechanical behavior of IS adhesive joint evaluation.

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