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Acoustic emission signals correlation with sliding friction behaviour of different materials pairs

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Tribological systems are studied with acquisitions systems associated to several kinds of sensors. For example, load and torque sensors are used to measure the friction coefficient, thermocouples to evaluate the mean contact temperature, vision systems to follows the evolution of the contact morphology. However, the observation of the active surfaces during sliding friction is impossible in most of the tribological systems. In this way, the study of acoustic emission signals emitted by the closed sliding contact is an interesting solution. Several authors, as Baranov *et al.* [1], related the amplitude and the frequency of these signals to materials physical proprieties and sliding contacts thermomechanical characteristics (*e.g.* hardness, dry friction and lubricated friction).

This work focuses on the acoustic emission signals related to three different tribological systems:

- A rotary sliding contact between a WC-Co pin against an alumina flat counterface (Fig. 1a) [2];
- A fretting contact between an alumina pin against alumina matrix composites containing metal nanoparticles (Fe or FeCr) flat counterface (Fig. 1b) [3];
- A reciprocating sliding flat on flat contact between a thermoplastic polyurethane (TPU) and a steel counterface (Fig. 1c). [4].

This work gathers several test campaigns dealing with effects of contact parameters as load and velocity on acoustic emission. Moreover, the studied contacts highlighted the dependence of acoustic emission signals towards the physicochemical properties of the material (*e.g.* chemical content and grain size distribution) in relation to the thermomechanical responses of the contact. More generally, these experiments showed the links that can be made between the overall tribological system consideration and the emission acoustic.

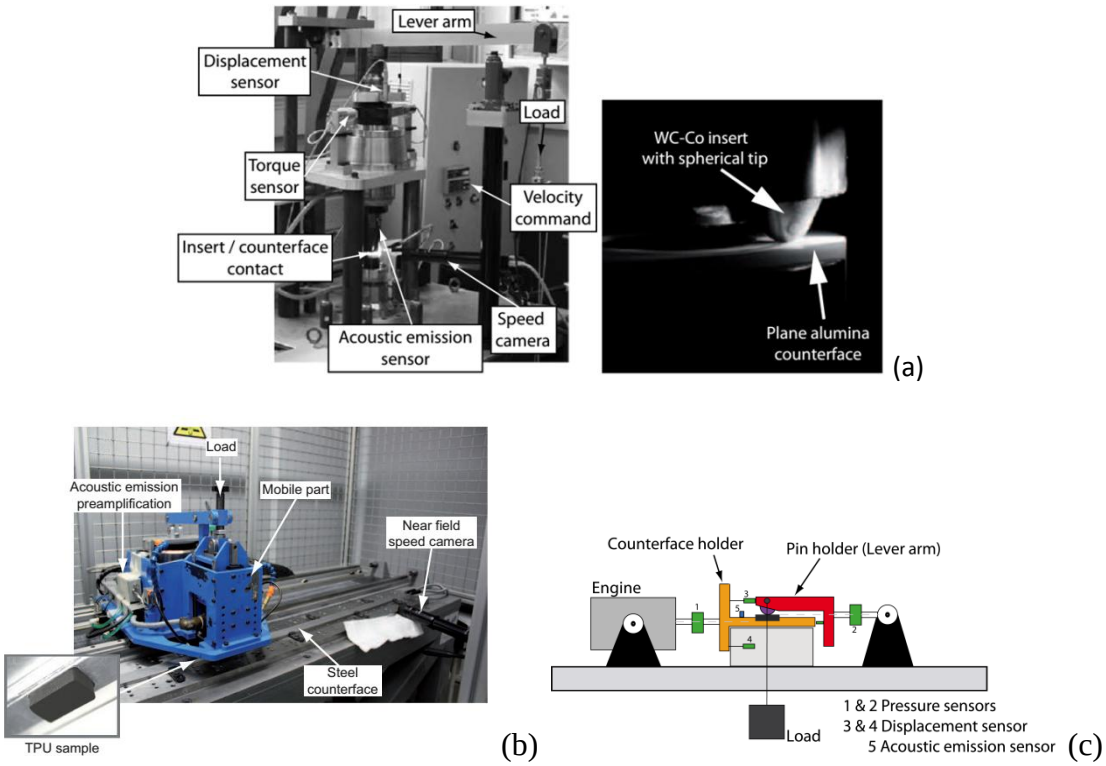

Figure 1. Experimental devices: a - rotary tribometer and the sliding contact between a WC-Co pin and an alumina counterface [2]; b - reciprocating long stroke tribometer and the TPU / steel contact [4]; c – Fretting device configuration and the alumina composite / alumina contact [3].

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