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# Dissipation of vibration in multicontact sliding interfaces

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Friction of solids with rough surfaces produces a vibration responsible of a wide band sound. This is the friction sound emitted for instance when rubbing itself hands or pushing a small object on a table. The sound may be easily reproduced in laboratory in various controlled conditions.

The mechanical process responsible of this friction-induced vibration involve two different scales. At macrocopic scale there is the sound and solid vibration whose typical wavelength is of the order of dozens of centimetres. At mesoscopic scale of the order of micrometre, the surface asperities generate impacts which excite the natural modes of solids but also dissipate the vibrational energy by various mechanisms. Since microscopic shocks are random events, this is a problem of statistical mechanics.

In this study, we present an experiment to investigate evolution of friction-induced vibration versus the nominal contact area. Two regimes are found. In some cases, the acoustical power is proportional to the contact area while in some others, the sound is constant. We propose to analyze the problem in terms of vibrational energy balance to explain this paradoxical result.

On the one hand, the vibrational power generated during the sliding is proportional to the rate and strength of microscopic impacts. The power being injected in the vibrating solid is then porpotional to the nominal contact area. This assertion is well confirmed by direct numerical simulation.

On the second hand, we assume that dissipation of vibration results from a competition between two processes, the internal damping of the material and the contact damping occurring at the interface. When internal dissipation dominates, the friction-induced vibration is proportional to the contact area while when interfacial dissipation dominates the sound is found to be constant.

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