CBI ERLANGEN

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Adhesion and friction of smooth, randomly rough, patterned, and particle-covered surfaces

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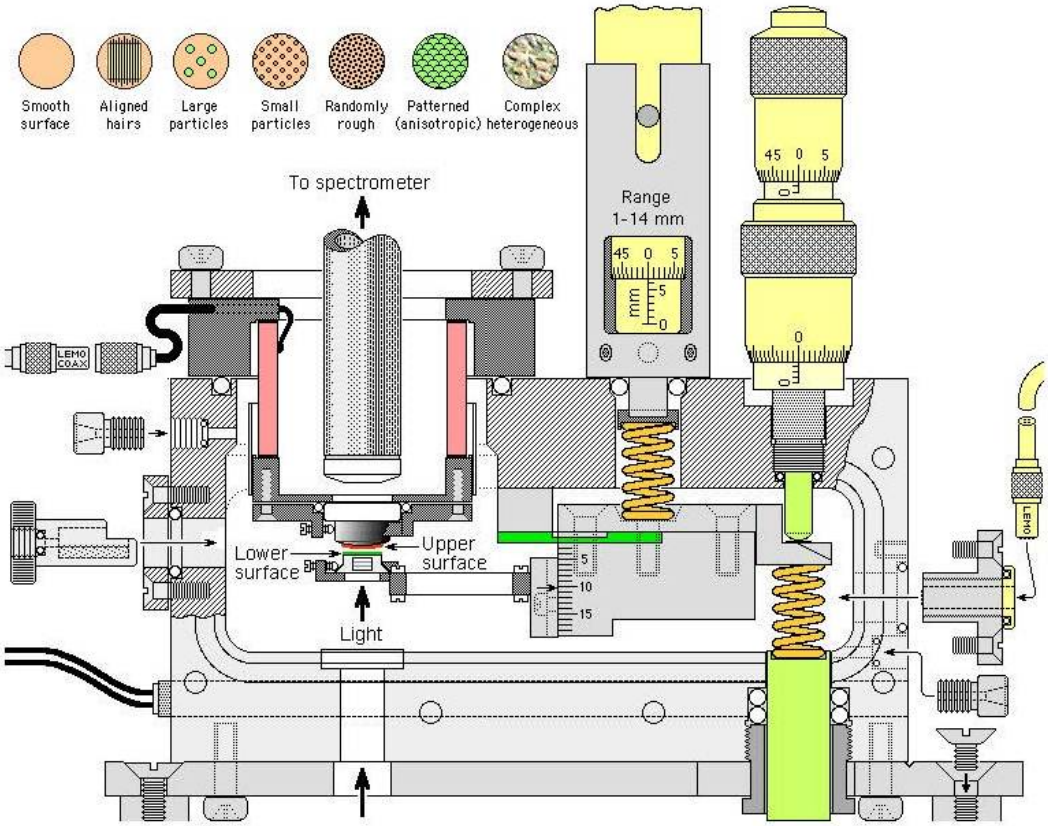

Two shearing surfaces can be “dry” or “lubricated” – the first arises when the surfaces or their asperities are in direct molecular contact; the second when separated by a thin liquid film, which can be aqueous or an organic liquid, e.g., oil. The surfaces or particles can be identical (symmetric configuration) or different (asymmetric configuration), and they can be molecularly smooth, or textured – randomly rough or patterned (exhibiting some in-plane and/or out-of-plane order). The surfaces could also be trapping particles, either nano-particles or macromolecules, micron- or macro-sized particles. Over the last ~15 years both the adhesion and especially the shear (friction and lubrication) forces of such systems have been studied using the Surface Forces Apparatus (SFA), as well as other techniques, which have provided important new and sometimes unexpected fundamental and practical insights, which will be briefly reviewed. These experiments have a bearing on diverse physical and (electro)chemical phenomena such as designing surfaces or particles to enhance or reduce adhesion or friction, designing patterned surfaces to reduce wear, tribo-electricity, and the phenomenon of Chemical Mechanical Polishing (CMP).

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