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Suppression of chaos assisted stiction in Casimir oscillators due to surface roughness WIJNAND BROER, GEORGE PALASANTZAS, JASPER KNOESTER, Zernike Institute for Advanced Materials, University of Groningen, HOLGER WAALKENS, Johann Bernoulli Institute of Mathematics and Computer Science, University of Groningen, VITALY B. SVETOVOY, MESA+Institute for Nanotechnology, University of Twente — At separations below 100 nm, the Casimir force strongly influences the actuation dynamics of Micro Mechanical systems (MEMS) in dry vacuum conditions. This theoretical analysis includes the effects of both the material optical response and that of surface roughness in an experimentally relevant way. Moreover, energy gains and losses during actuation are considered via driving and damping, respectively. We show that the system can exhibit chaotic motion for certain actuation parameter values due to the nonlinearity of the Casimir force. Surface roughness of the interacting components turns out to make the MEMS actuation less susceptible to chaotic motion than that of flat surfaces.

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