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Erratum: "Ultrathin metallic coatings can induce quantum levitation between nanosurfaces" [Appl. Phys. Lett. 100, 253104 (2012)]

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The numerical calculation of the $n = 0$ term in the Matsurbara summation performed to obtain the Casimir-Lifshitz free energy between coated surfaces in toluene was done incorrectly in our recent paper.[1] This was due to an incorrect value of $\varepsilon_{\text{silica}}(0)$ used by mistake for the uncoated silica surface. The retardation driven repulsion demonstrated in the systems with toluene does not occur when the calculation is done in a correct way. Thus, Figs. 4 and 5 were incorrect. However as can be seen in our new Fig. 1, the predicted effect occurs for other systems including glycerine near water-air interfaces. Glycerine, used in medical and personal care products (e.g., in toothpaste), may experience repulsive Casimir-Lifshitz forces with a glycerine film adsorbed on an air-water interface. This effect depends on film thickness and is markedly enhanced by retardation.

There is a rule of thumb that says that the interaction between two objects is repulsive if the value of the dielectric function (on the imaginary frequency axis) of the medium separating the objects is in between those of the objects, otherwise it is attractive. Based on this rule, the results in Fig. 1 can be explained in the following way: In a dominating part of the spectrum, the dielectric function of glycerine (G) is larger than that of water (W), which in turn is larger than that of air (A). This leads to a repulsion between the two interfaces in the air-water-glycerine system. For a very large separation between the interfaces (very large water layer thickness), the interaction is dominated by small frequency contributions where the dielectric function of water is larger than that of glycerine. This leads to an attraction for a water layer thickness larger than around 300 Å, which is outside the region covered by the figure. Now, if a thin layer of glycerine is introduced at the water-air interface, very little happens at large separations. However, when the separation decreases, the effect of the film gradually increases, and the result ultimately approaches that of a glycerine-water-glycerine system. In that system, there is an attraction between the water interfaces at all separations.

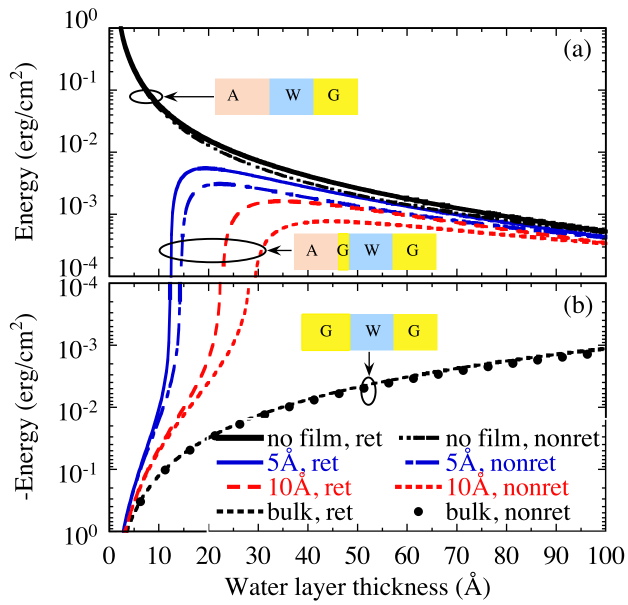

FIG. 1. The retarded and non-retarded Casimir-Lifshitz interaction free energy between a glycerine surface and a glycerine coated air surface in water. For finite film thickness, the interaction is attractive at short distances and repulsive above a critical levitation distance. This levitation distance depends on film thickness. Results are shown for 0 Å, 5 Å, 10 Å, and infinite (denoted by bulk) glycerine film thickness. Here, we use dielectric functions from Boström *et al.*[2]

[1]M. Boström, B. W. Ninham, I. Brevik, C. Persson, D. F. Parsons, and B. E. Sernelius, Appl. Phys. Lett. **100**, 253104 (2012).
[2]M. Boström, S. Å. Ellingsen, I. Brevik, D. F. Parsons, and B. E. Sernelius, Phys. Rev. A **85**, 064501 (2012).

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