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ERRATUM

# Erratum to: Capillary and van der Waals forces between uncharged colloidal particles linked by a liquid bridge

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In a recent paper published in Colloid and Polymer Science [1] dealing with the comparison between the capillary forces and the van der Waals ones established between colloidal particles linked by concave liquid bridges, unfortunately there, there is a sign error in Eq. 8, which describes the capillary force between a pair of particles. The correct equation should read, as pointed out by Bakken et al. [2]:

$$F_{cap} = -2\pi\gamma R\sin\alpha\sin(\alpha+\theta) + \pi\gamma R^2\sin^2\alpha\left(\frac{1}{L}-\frac{1}{\rho}\right) \quad (1)$$

where $\gamma$ is the surface tension of the liquid of the bridge, $R$ is the solid particle's radius, $\alpha$ is the half-filling angle, $\theta$ is the wetting angle and $\rho$ and $L$ are the principal radii of the liquid meniscus [1].

This correction does not affect the method of determining the liquid meniscus shape neither the limiting inter-particle distances of the concave liquid bridges, although Eq. 1 alters the published [1] shape of the capillary force *vs.* inter-particle distance, $H$. With the correct equation, repulsive capillary forces will only persist for wetting angles, $\theta$, lower than ≈20° in a rather limited liquid volume range, $V_{rel}$<0.023, and just for the longest possible distances between particles, practically immediately before the bridge's rupture, as displayed in Fig. 1.

When comparing the corrected capillary forces with the van der Waals ones, Fig. 2, qualitatively, similar results than already published [1] are found, but now the distances at which the ratio $F_{vdW}/F_{cap}$ diverges are displaced to longer inter-particle separations.

With the correct equation for the capillary force, the induced deep minimum on the total force at inter-particles distances close to zero is still persisting. Since the van der Waals force becomes very small when the particles separate and $H_0$ (distances at which $F_{cap}$=0) are now found at larger distances than before [1], as displayed in Fig. 1, the effect of $F_{vdW}$ on $H_0$ is rather small. It is only at extremely low liquid contents ($V_{rel}$<$10^{-5}$) and wetting angles $\theta\leq 20°$ where

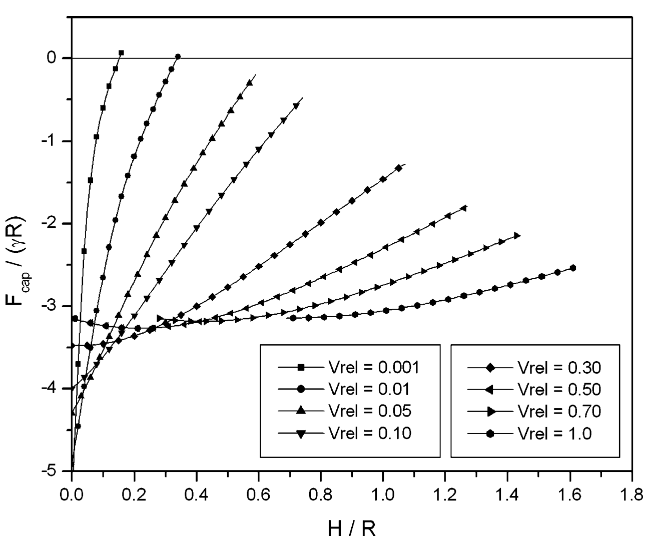


**Fig. 1** Scaled capillary force, $F_{cap}/(\gamma R)$, as a function of the dimensionless inter-particle distance, $H/R$, for different liquid contents when $\theta$=0°, according to Eq. 1

The online version of the original article can be found at http://dx.doi.org/10.1007/s00396-009-2106-0.

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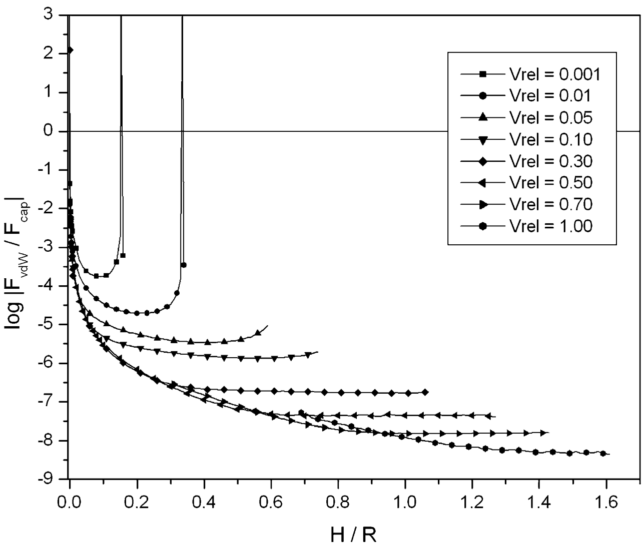


**Fig. 2** Ratio $F_{vdW}$ /$F_{cap}$ as a function of the dimensionless inter-particles distance, for several relative volume of meniscus liquid, $V_{rel}$, being $\theta$=0° and $A_{dry}$=10$A_{wet}$

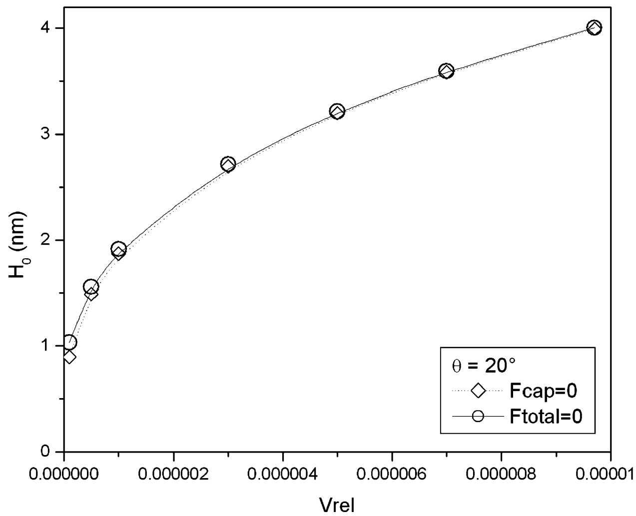


**Fig. 3** Inter-particles distances, $H_0$, at which $F_{cap}$ and $F_{tot}$ are zero, as a function of the relative volume of meniscus liquid, $V_{rel}$, for wetting angles $\theta$=20°

the impact of the van der Waals force is noticeable, shifting the distances at which $F_{tot}$=$F_{cap}$+$F_{vdW}$=0 to slightly larger values, as shown in Fig. 3. The van der Waals force, $F_{vdW}$, contribution to $H_0$ is at most 20%, value reached in the limit of vanishing liquid content and $\theta$=20°. For decreasing angles, the impact of $F_{vdW}$ on $H_0$ is practically negligible.

## References

1. Megias-Alguacil D, Gauckler LJ (2010) Capillary and van der Waals forces between uncharged colloidal particles linked by a liquid bridge. Colloid Polym Sci 288:133–139
2. Bakken M, McCulfor J, Anklam MR (2010) Letter to the Editor. AIChE J 56:2489–2490