Erratum: Gas-induced friction and diffusion of rigid rotors [Phys. Rev. E 97, 052112 (2018)]

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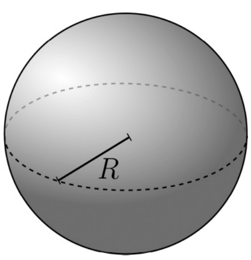
The diffusion tensors provided in Table II of the original paper hold for $\gamma_{\rm s} = 1$ only. The correct expressions for arbitrary $\gamma_{\rm s}$ are given below. This does not affect the conclusions of the paper.

TABLE II. Center-of-mass (cm) and rotational (rot) diffusion tensors of homogeneous spheres, cylinders, and cuboids for specular and diffuse reflection with accommodation coefficient $\alpha_{\rm c}$ and surface temperature $T_{\rm s} = \gamma_{\rm s}^2 T$. The gas temperature is denoted by T, $n_{\rm g}$ is the gas density, m the mass of a gas atom, and M the total mass of the particle. The radius of the sphere and cylinder is R, the cylinder length is ℓ with symmetry axis $\mathbf{m}(\Omega)$, and the edge lengths of the cuboid are a, b, and c with principal axes $\mathbf{n}_a(\Omega)$, $\mathbf{n}_b(\Omega)$, and $\mathbf{n}_c(\Omega)$; see sketches. For $\gamma_{\rm s} = 1$ all diffusion tensors satisfy the relations (47) with the corresponding friction tensors in Table I.

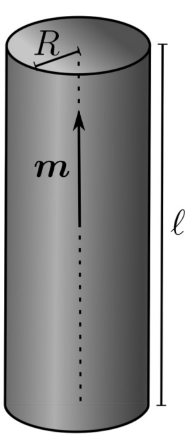
Sphere



$$\mathrm{D}_{\rm cm} = \tfrac{8}{3} n_g R^2 \sqrt{2\pi m (k_{\rm B} T)^3}\left(1 + \tfrac{\gamma_{\rm s}^2 - 1}{2} + \tfrac{\pi}{8}\alpha_{\rm c}\gamma_{\rm s}\right)\mathbb{1}$$

$$\mathrm{D}_{\rm rot} = \tfrac{4}{3}\alpha_{\rm c} n_g R^4 \sqrt{2\pi m (k_{\rm B} T)^3}\,\tfrac{1+\gamma_{\rm s}^2}{2}\mathbb{1}$$

Cylinder



$$\mathrm{D}_{\rm cm} = D_{\rm cm}^{\perp}(\mathbb{1} - \mathbf{m}\otimes\mathbf{m}) + D_{\rm cm}^{\parallel}\mathbf{m}\otimes\mathbf{m}$$

$$\mathrm{D}_{\rm rot} = D_{\rm rot}^{\perp}(\mathbb{1} - \mathbf{m}\otimes\mathbf{m}) + D_{\rm rot}^{\parallel}\mathbf{m}\otimes\mathbf{m}$$

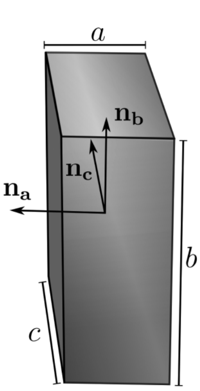
$$D_{\rm cm}^{\perp} = n_g R\ell\sqrt{2\pi m (k_{\rm B} T)^3}\left[2 + \alpha_{\rm c}\left(-\tfrac{1}{2} + \tfrac{3}{4}(\gamma_{\rm s}^2 - 1) + \tfrac{\pi\gamma_{\rm s}}{4} + \tfrac{1+\gamma_{\rm s}^2}{2}\tfrac{R}{\ell}\right)\right]$$

$$D_{\rm cm}^{\parallel} = n_g R\ell\sqrt{2\pi m (k_{\rm B} T)^3}\left[4\tfrac{R}{\ell} + \alpha_{\rm c}\left(\tfrac{1+\gamma_{\rm s}^2}{2} - (3 - \gamma_{\rm s}^2)\tfrac{R}{\ell} + \tfrac{\pi\gamma_{\rm s}}{2}\tfrac{R}{\ell}\right)\right]$$

$$D_{\rm rot}^{\perp} = \tfrac{1}{12} n_g R\ell^3\sqrt{2\pi m (k_{\rm B} T)^3}\left\{2 + 12\tfrac{R^3}{\ell^3} + \alpha_{\rm c}\left[\tfrac{3\gamma_{\rm s}^2 - 5}{4} + \tfrac{\pi\gamma_{\rm s}}{4} + \tfrac{1+\gamma_{\rm s}^2}{2}\left(3\tfrac{R}{\ell} + 6\tfrac{R^2}{\ell^2}\right) + \left(\tfrac{3\pi\gamma_{\rm s}}{2} - 3(3 - \gamma_{\rm s}^2)\right)\tfrac{R^3}{\ell^3}\right]\right\}$$

$$D_{\rm rot}^{\parallel} = \tfrac{1}{2} n_g R^3\ell\sqrt{2\pi m (k_{\rm B} T)^3}\,\alpha_{\rm c}\tfrac{1+\gamma_{\rm s}^2}{2}\left(2 + \tfrac{R}{\ell}\right)$$

Cuboid



$$\mathrm{D}_{\rm cm} = D_{\rm cm}^{abc}\mathbf{n}_a\otimes\mathbf{n}_a + D_{\rm cm}^{bac}\mathbf{n}_b\otimes\mathbf{n}_b + D_{\rm cm}^{cba}\mathbf{n}_c\otimes\mathbf{n}_c$$

$$\mathrm{D}_{\rm rot} = D_{\rm rot}^{abc}\mathbf{n}_a\otimes\mathbf{n}_a + D_{\rm rot}^{bac}\mathbf{n}_b\otimes\mathbf{n}_b + D_{\rm rot}^{cba}\mathbf{n}_c\otimes\mathbf{n}_c$$

$$D_{\rm cm}^{abc} = \tfrac{1}{\pi} n_g bc\sqrt{2\pi m (k_{\rm B} T)^3}\left[4 + \alpha_{\rm c}\left(\gamma_{\rm s}^2 - 3 + \tfrac{1+\gamma_{\rm s}^2}{2}\tfrac{ab+ac}{bc} + \tfrac{\pi\gamma_{\rm s}}{2}\right)\right]$$

$$D_{\rm rot}^{abc} = \tfrac{n_g bc(b^2+c^2)\sqrt{2\pi m (k_{\rm B} T)^3}}{12\pi}\left\{\tfrac{4a(c^3+b^3)}{bc(b^2+c^2)} + \alpha_{\rm c}\left[\tfrac{1+\gamma_{\rm s}^2}{2} - \left(3 - \gamma_{\rm s}^2 - \tfrac{\pi}{2}\gamma_{\rm s}\right)\tfrac{a(c^3+b^3)}{bc(b^2+c^2)} + \tfrac{1+\gamma_{\rm s}^2}{2}\tfrac{3a(b+c)}{b^2+c^2}\right]\right\}$$

