Erratum: "Nanoindentation of polydimethylsiloxane elastomers: Effect of crosslinking, work of adhesion, and fluid environment on elastic modulus" [J. Mater. Res. 20, 2820 (2005)]

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The authors would like to take this opportunity to rectify a derivational error in our recently published research article. Equation (12) (p. 2824) in the original manuscript pertains to the calculation of the Young's modulus from nanoindentation data considering a Johnson, Kendall, Roberts (JKR) adhesion model:

$$E_s^{JKR} = \sqrt{\frac{S^3(1-{\nu_s}^2)^2}{6R} \cdot \left[\frac{1}{P + 2F_{po}^{JKR} + 2F_{po}^{JKR}\sqrt{\left(\frac{P}{F_{po}^{JKR}} + 1\right)}}\right]} \quad . \tag{12}$$

The derivation of Eq. (12) is based on an assumption that the contact stiffness is related to the reduced modulus according to Eq. (5) (p. 2823):

$$S = \frac{dP}{dH} = 2aE_r \quad . \tag{5}$$

However, this relationship is appropriate only when applying the Hertz contact theory, not for JKR contact theory. The proper relationship between the contact stiffness and the reduced modulus for JKR contact was correctly derived by Pietrement and Troyon[1] as follows:

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$$S = \frac{3}{2}\left(\frac{4}{3}E_r\right)^{2/3}(4RF_{po}^{JKR})^{1/3} \left(\frac{1 - \dfrac{1}{1 + \sqrt{1 + \dfrac{P}{F_{po}^{JKR}}}}}{1 - \dfrac{1}{3\left(1 + \sqrt{1 + \dfrac{P}{F_{po}^{JKR}}}\right)}} \right) \left(\frac{1 + \sqrt{1 + \dfrac{P}{F_{po}^{JKR}}}}{2} \right)^{2/3} \tag{E1}$$

Modification of the aforementioned equation with the appropriate contact stiffness [Eq. (E1)] alters the nanoindentation results presented in Figs. 7 and 9 (pp. 2827 and 2828) of the original manuscript. The new results of E^{JKR} are in closer magnitude to data from bulk unconfined compression testing. However, since the statistical significance of the results is maintained (unchanged) for all testing environments, the discussion and conclusions stated in the original manuscript remain undisturbed and valid.

The following corrections to the original manuscript are required:

Section II, p. 2824: Under Part E. Adhesion modeling and measurements, Eq. (12) should appear as follows:

$$E_s^{JKR} = \sqrt{\frac{S^3(1-\nu_s{}^2)^2}{6R} \cdot \left[\left(\frac{1 - \dfrac{1}{3\left(1 + \sqrt{1 + \dfrac{P}{F_{po}^{JKR}}}\right)}}{1 - \dfrac{1}{\left(1 + \sqrt{1 + \dfrac{P}{F_{po}^{JKR}}}\right)}} \right)^3 \frac{1}{P + 2F_{po}^{JKR} + 2F_{po}^{JKR}\sqrt{\left(\dfrac{P}{F_{po}^{JKR}} + 1\right)}} \right]} \ . \tag{12}$$

Section III, p. 2827: The first line of the last paragraph should read:

Application of the JKR adhesion contact model [Eq. (12)] estimates elastic moduli values significantly lower ($p < 0.013$) than the expected unconfined compression value for PDMS 10-1, 15-1, and 20-1, whereas the differences between the two for PDMS 25-1 and 30-1 were not significant ($p < 0.1$).

Figure 7, p. 2827, should appear as follows:

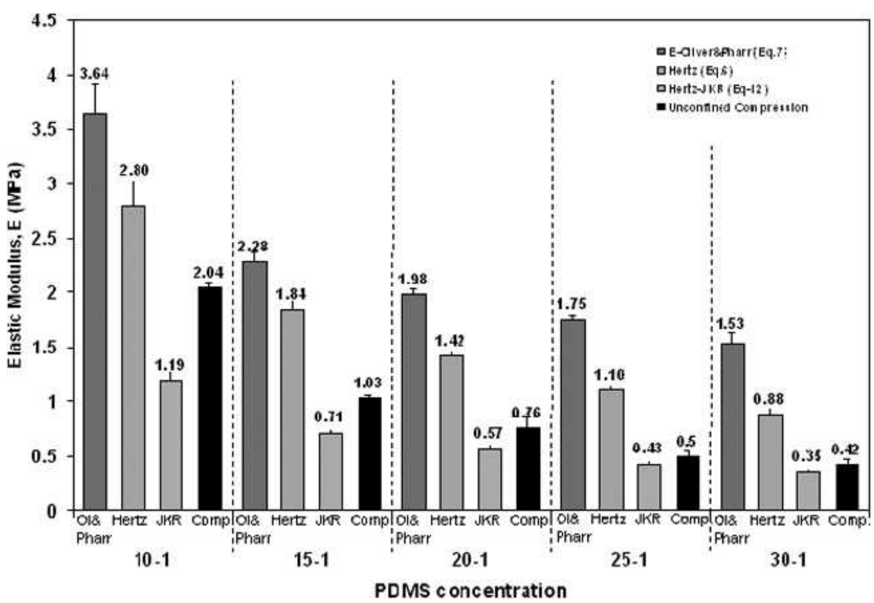

FIG. 7. Elastic moduli obtained from the nanoindentation experiments (dry conditions) using the Oliver and Pharr, Hertz, and JKR models (left to right). For comparison, the unconfined compression elastic moduli results are also shown for each PDMS concentration. Significant differences ($p < 0.03$) between the elastic moduli calculated for each PDMS concentration were observed, regardless of the model used.

Figure 9, p. 2828, should appear as follows:

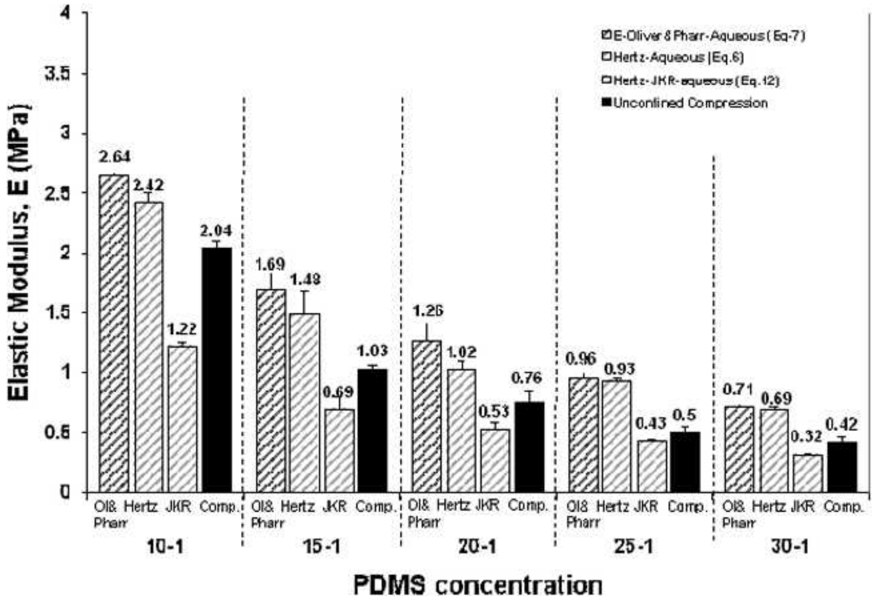

FIG. 9. Elastic moduli obtained from the nanoindentation experiments (aqueous conditions) using the Oliver and Pharr, Hertz, and JKR models (left to right). For comparison, the unconfined compression elastic moduli results are also shown for each PDMS concentration.

References, p. 2830: The following reference should be added:

O. Pietremont and M. Troyon: General equations describing elastic indentation depth and normal contact stiffness versus load. *J. Colloid Interface Sci*. **226,** 166 (2000).