assumption .

The present work has several implications and applications. We emphasize the capabilities of dielectric spectroscopy to monitor the dynamics of cellular systems, e.g., cells during cell cycle division, using synchronized yeast cells [3, 11, 39], or monolayers of interconnected cells [40, 41]. Also the method is able to assess the dielectric behavior of linear aggregates or rouleaux of erythrocytes, where the ellipsoidal or cylindrical approximations are not adequate [42, 43].

The proposed representation is a powerful alternative to finite element or other purely numerical approaches, because it provides the analytical framework to explain and predict the complex dielectric spectra occurring in bioengineering applications. Extension of this method to other surfaces of revolution, for example linear clusters with more than 4 particles, is straightforward providing an adequate parametric equation is available. Finally, in many cases (e.g. shapes with high symmetry) the method is faster, offers accurate solutions and last but not least can be integrated in fitting procedures to analyze experimental spectra.

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Appendix: Integration over φ

The integrals over $(\varphi - \varphi')$ are performed with the following elliptic integrals,

$$\int_0^\pi \frac{1}{(a-b\cos\varphi)^{3/2}} d\varphi = \frac{2}{\sqrt{a-b}} \frac{1}{a+b} E\left(-\frac{2b}{a-b}\right) \tag{A.1}$$

$$\int_0^\pi \frac{\cos\varphi}{(a-b\cos\varphi)^{3/2}} d\varphi = \frac{2}{\sqrt{a-b}} \frac{1}{b} \left[\frac{a}{a+b} E\left(-\frac{2b}{a-b}\right) - K\left(-\frac{2b}{a-b}\right)\right], \tag{A.2}$$

$$\int_0^\pi \frac{\cos^2\varphi}{(a-b\cos\varphi)^{3/2}} d\varphi = \frac{2}{\sqrt{a-b}} \frac{1}{b^2} \left[\frac{2a^2-b^2}{a+b} E\left(-\frac{2b}{a-b}\right) - 2aK\left(-\frac{2b}{a-b}\right)\right], \tag{A.3}$$