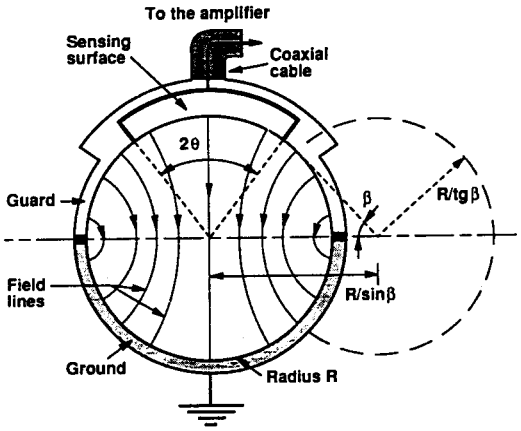
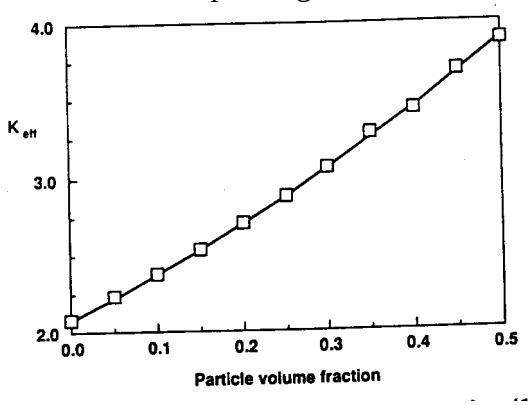
Louge M. and Opie M.: "Measurements of the Effective Dielectric Permittivity of Suspensions," *Powder Tech.* **62**, 85-94 (1990).

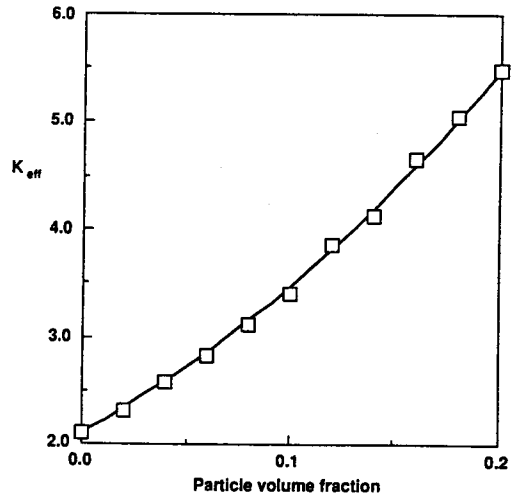
A technique to measure the effective dielectric permittivity of suspensions is described. In these measurements, test powders are suspended in petroleum jelly at any desired voidage. The technique is illustrated using spherical glass beads of various sizes, a catalyst powder with and without water contamination, metal spheres, and metal flakes. For each suspension, a model is selected to fit the data. In the context of metal flakes, a model is derived for the effective dielectric permittivity of a suspension of ellipsoids in an electric field of random orientation. For complex powders, the technique is shown to represent a necessary step towards quantitative measurements of voidage using capacitance diagnostics.



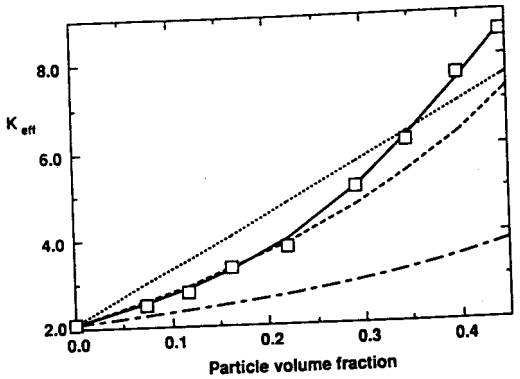
Sketch of a section of the measuring cup through the sensing-guard assembly. Electric field lines are shown for a homogeneous dielectric. The measuring cup was typically operated with an amplifier gain of 2.09.



Plot of K_{eff} *vs*. particle volume fraction (1-φ) for 70 μm glass spheres (K_p=7.2) suspended in petroleum jelly. The squares represent the experimental data and the solid line is the Maxwell model.



Best fit of the measured K_{eff} for iron flakes suspended in petroleum jelly. The squares are the experimental data, and the solid line is the expression of equation (19) for prolate spheroids of aspect ratio c/a = 0.29.



Plot of K_{eff} *vs*. particle volume fraction (1-φ) for wet FCC particles suspended in petroleum jelly. The squares are the experimental values. Both the series and the Maxwell models assume an infinite value of K_p, but fail to reproduce the data. The parallel model assumes $K_p = 17$ and the Böttcher model assumes $K_p = 25$. The dotted line represents the parallel model, the solid line the Böttcher model, the dashed line the Maxwell model and the dotted-dashed line the series model.