for a dipole in free space where the dipole is modelled as 2 point charges distance d form one another 30/10/2020

if for a point charge interacting with a anisotropic surface the potential is 4/11/2020

then for a second point charge in the same system can be expressed as

where

is the displacement of the second particle in the z direction is the displacement in the R direction, is the angel between the arbitrary point and the second point charge in the R plain at the first point charge

using the principle of superposition, the potential at an arbitrary point is given by

using Taylor expansion when d=0 and and higher terms ignored

as then

(\sqrt(R^2+(z-c )^2 )-\sqrt(R^2 (1+((dsin(phi))^2)/R^2 -(2dsin(phi)cos⁡(θ))/R)+(z-c-dcos(phi)) )^2 ))/(\sqrt(R^2 (1+((dsin(phi))^2)/R^2 -(2 dsin(phi) cos⁡(θ))/R)+(z-c-dcos(phi) )^2 ) \sqrt(R^2+(z-c )^2 ))

6/11/2020

Diagram

Description automatically generated

for a redefined theta

determining with and

using Taylor expansion when d=0 and and higher terms ignored

therefore the first two terms of these expressions gooses to

substituting the Taylor expansions in we get

as

derivation for the potential of a point charge above thin layer of uniform dielectric above an anisotropic substrate bulk material 9/11/2020

using the furrier transform

apply boundary conditions as and as

applying the conditions ,

and ,

(2)

(1)+(5)

(1)-(5)

(4)

(8)+(3)

(3)-(8)

sub (9) in to (6)

sub (10) in to (7)

sub (11) in to (12)

if and the results with out the film are reproduced

sub (13) into let

potential in bulk liquid for a point charge

looking at a system for a dipole above an anisotropic surface with a thin layer above 10/11/2020

taking the dipole to be comprised of 2 point charges with potentials

particle 1:

particle 2:

using the superposition principle

where is the angle of the particle to the normal and is the angel between and