

Analytical Solution of N-S Equations in the Taylor-Couette Apparatus

The steady 2-D solution of the Navier-Stokes equations for the Taylor Couette experiment is:

$$V(r) = r_1 \omega_1 \frac{r_0/r - r/r_0}{r_0/r_1 - r_1/r_0} + r_0 \omega_0 \frac{r/r_1 - r_1/r}{r_0/r_1 - r_1/r_0}$$

where $V(r)$ = circumferential component of the fluid's velocity

(the other two components are assumed to be zero)

r_1 = inner cylinder's radius

r_0 = outer cylinder's radius

ω_1 = inner cylinder's angular speed

ω_0 = outer cylinder's angular speed