III. STRESS AND PRESSURE DISTRIBUTIONS

This section is devoted to the presentation of the resulting stress and pressure gradients existing throughout the wafer, with emphasis placed on the effects of the following parameters: (1) diameter-to-thickness ratio; (2) wafer material properties; (3) anvil-wafer friction factor; and (4) influence of elastically deformable radial constraints.

The experimental and analytical applied force-displacement results achieved in the compression of an unconfined 303 stainless steel wafer are shown in Figure 6. The ordinate of this, and subsequent force-displacement diagrams, has been non-dimensionalized by dividing the applied force, equation (43), by the wafer surface area and the material yield strength σ_0. The abscissa has likewise been non-dimensionalized by forming the ratio of current radius to inital radius. The predicted curve is in good agreement with the data for the low-friction lubricant (molybdenum disulphide), but the same comparison for the high-friction lubricant is not as favorable, except perhaps, at the approach of higher loads. This latter disagreement is to be expected since the analysis was predicated on the concept of proportional straining, which in turn requires that the surface shear stress be small. Since the applied force corresponds to the area under the axial normal stress curve, its agreement with the experimental data suggests strongly that the