exchange and dipolar energy will be negligible compared to the remaining energy terms. It follows that domain walls will be extremely cheap and an intergrain domain structure will occur. Considering this, one expects independent grain behavior. Conversely, experimental confirmation of the independent grain theory indirectly supports the validity of the domain theoretical calculation which predicts the strain dependence of the equilibrium exchange and dipolar energy.

From the domain theoretical calculation, it was concluded that a sliver or needle shaped domain structure nucleates behind the shock front. This domain structure is an effect rather than a cause since it provides negligible contribution to the shape of the magnetization curve of the shock created ferromagnetic material in the region of large elastic and plastic strain.

It begins to appear that the prediction of magnetic behavior behind the shock front is much simpler than the equivalent prediction in unstrained material. First, the equilibrium exchange and dipolar energy can be ignored in favor of the much simpler induced anisotropy energy. This is definitely not the case in unstrained material. Secondly, in polycrystalline material it appears that the magnetic grain-grain interaction effects are not substantial and magnetic properties can be obtained by simply averaging the behavior of a single independent grain.

From this, one might speculate on the magnetic response of natural or meteoritic material subject to similar shock loading. Here one is confronted with many additional complications. Chemical and compositional gradients along with coexistence of nonmagnetic and magnetic phases produce variations in the saturation magnetization, exchange integral, and magnetoelastic properties. It would be extremely complicated to construct an adequate energy expression to describe this material. However, from the results of the work described here, one would expect the magnetic response of a local region to depend only on the induced anisotropy in that region and be independent of long range interaction with neighboring material. Consequently, the macroscopic magnetic behavior should be predictable from a similar average over the chemical and compositional structure of the material.

The effect of porosity, as discussed in Section 3.4, is not expected to contribute significantly in the region of the magnetization curve where the experimental data was obtained. The present experimental results confirm this. The porosity effect is expected to become substantial in the lower region of the magnetization curve.

A consistent treatment of the contribution of finite strain to the shock induced anisotropy effect is carried out in Appendix III with the thermodynamics developed in Chapter II. This is required by the high strains considered in this work. Calculations show that the contribution is not substantial. The experimental data verify this conclusion. It follows that, at least for the present material, the conventional magnetoelastic theory of Becker and Doring provides an adequate description of the shock induced anisotropy effect.

The experimental technique developed for this work provides a simple means of measuring the state of magnetization in shocked material. The fundamental difficulties, discussed thoroughly in Section 5.3, are degradation of the shock profile when passing the solenoid grid and lateral rarefaction waves. The first problem can be circumvented by a proper choice of solenoid material at the grid interface as was experimentally established in Section 4.2.1. The second problem could be minimized by better design of the pickup coil-specimen geometry. It is believed that this technique could be useful in more general investigation of the magnetostructural properties of materials.