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Application of landau theory to high pressure phase transitions

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Landau theory has turned out to be very useful for the description of temperature induced phase transitions. Here we will discuss the case of structural phase transitions driven by high hydrostatic pressure, as they are of major importance for understanding processes in the interior of the earth. Since at high pressures the deformations of the minerals are generally very large, the corresponding strains cannot be treated as infinitesimal, but one has to deal with finite strains. These so called "geometrical nonlinearities" are accompanied by "physical nonlinearities", which are expressed by various kinds of nonlinear equations of state V(P). In [1] we have constructed a Landau Theory, which takes into account these nonlinearities. For calculation of the nonlinear elastic energy we are using a very efficient parametrization of the nonlinear elastic constants of anisotropic crystals [2] which works very well for many earth relevant minerals like olivine, garnet, stishovite, etc. Our new Landau theory excellently describes the pressure dependences of strains and elastic constants (Birch-coefficients) around the phase transitions of $BaCuSi_4O_{10}$ and $BaCrSi_4O_{10}$ [3] and we are confident, that it may be successfully applied to other earth forming minerals near their high pressure phase transitions. **Acknowledgements**: Support by the Austrian FWF (P19284-N20) and the University of Vienna (IK 1022-N) is gratefully acknowledged.

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