Geophysical Research Abstracts,
Vol. 11, EGU2009-5724, 2009
EGU General Assembly 2009

MagEval : a new geothermometer (50°C-250°C) in sedimentary rocks

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Experimental works showed that heating immature claystones at 95°C lead to the formation of pyrrhotite and magnetite, both ferromagnetic, and then capable to retain a magnetization. Submicron pyrrhotites, which are diagnostic of burial, are identified using a magnetic transition at $\tilde{3}$5K that we called the P-transition. Magnetite is identified through its 120K Verwey magnetic transition. When heating from 100°C up to 250C°, the relative concentration of pyrrhotite and magnetite can be traced from the pattern of the P-transition. We call P the parameter that describes this evolution. Burial-like and fast-like heating experiments displays consistent evolution of P with temperature. This opens the application of this geothermometer, that we call MagEval, in long-lived heating process as basin, fold-and-thrust belts, as well as in short-lived heating process as intrusives aureoles or shear-heat in fault zones. Pyrrhotite and magnetite assemblage are observed in claystones, siltstones, sandstones, and marly carbonates. This observation extends potentially the applicability of MagEval compared to geothermometers based on the alteration of organic matter.