

PERTEMUAN PERSATUAN (MEETINGS OF THE SOCIETY)

CERAMAH TEKNIK (TECHNICAL TALK)

Kerry A. Hegarty: Quantitative thermal history determination using Apatite Fission Track Analysis (AFTA)

Abstrak (Abstract)

Apatite Fission Track Analysis (AFTA) is uniquely useful for a variety of geological problems encountered by exploration geologists in the oil industry. AFTA can provide quantitative paleotemperature information in both sedimentary basins and hard-rock provinces. The integrated AFTA approach to thermal history analysis has been developed by GEOTRACK research scientists in Melbourne, Australia over the last eight years and has been proven in application to many thermal and tectonic settings, for example, thrust belts, uplifted basement, extensional terrains, all types of sedimentary basins, basin inversion, recent heating. The technique is particularly useful in old basins devoid of plant matter, and in red-bed sequences, as well as in areas affected by more than one phase of high temperatures. In favourable situations, AFTA can provide a complete thermal history in the range of temperatures similar to the "oil window".

AFTA involves the analysis of radiation damage (fission tracks) to the crystal lattice of detrital apatite produced by the spontaneous fission of ^{238}U atoms. These tracks are progressively healed (annealed) at a rate which depends sensitively on temperature. The kinetics of this process have been intensively studied in laboratory experiments and in carefully controlled geological settings. Because new fission events occur continually, tracks are constantly forming and each track experiences a different proportion of the total thermal history. By analyzing the amount of annealing in apatite grains from a rock sample, constraints can be placed not only on the maximum paleotemperature but also on the timing of cooling from maximum paleotemperatures. In suitable cases, constraints can also be placed on the paleogeothermal gradient prior to uplift, and the amount of uplift and erosion.



KERRY A. HEGARTY

Laporan (Report)

Dr. Kerry A. Hegarty of Geotrack International Pty. Ltd., Melbourne, Australia, gave the above talk to about 25 members at the Geology Dept., University of Malaya, on 19 September 1989.

Besides giving a description of the basic principles of the technique Dr. Hegarty included a series of case studies, illustrating the application of AFTA in a variety of geological contexts. These include: Bowen Basin, Australia; East Midlands, United Kingdom; Taranaki Basin, New Zealand; Appalachian Basin, New York. In addition, she included a discussion of some of Geotrack's non-exclusive studies in California, Alaska, Papua New Guinea and New Zealand.

G.H. Teh