

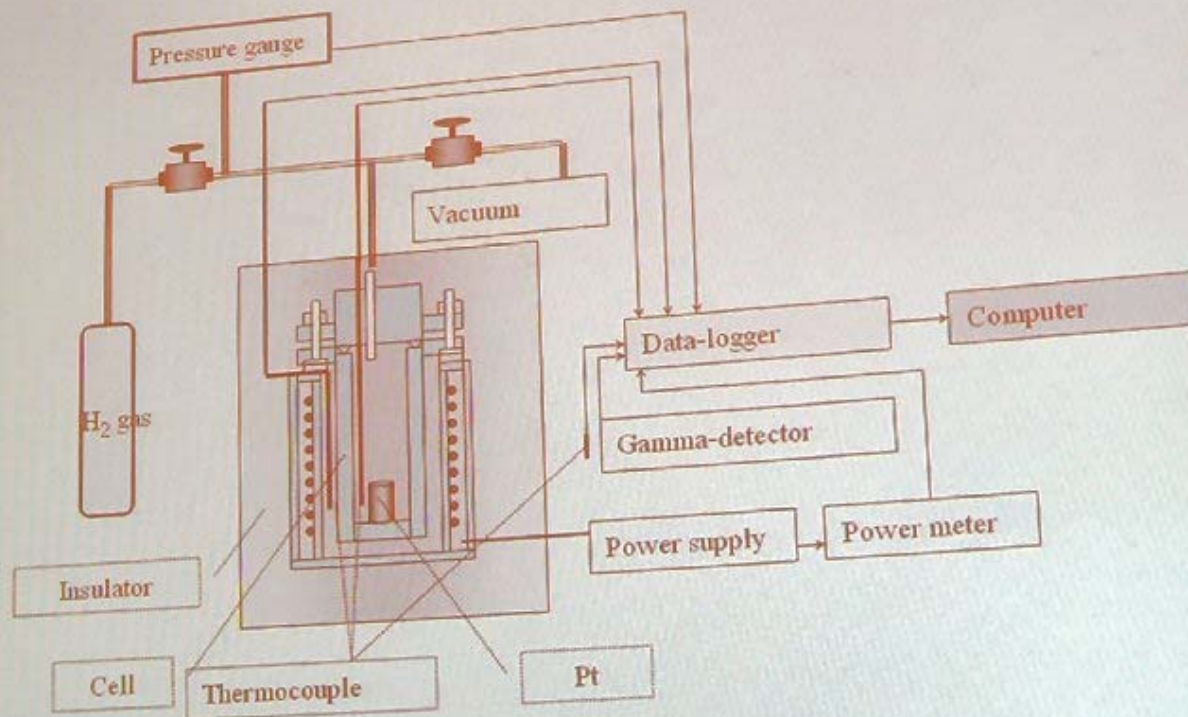
# Anomalous heat generation during hydrogenation of phenanthrene

Department of Engineering, Hokkaido University,  
Tadahiko Mizuno, Kazuya Kurokawa, Kazuhisa Azumi,  
Sequence Co. Ltd, Shigemi Sawada,  
Hideo Kozima,  
Cold Fusion Research Laboratory

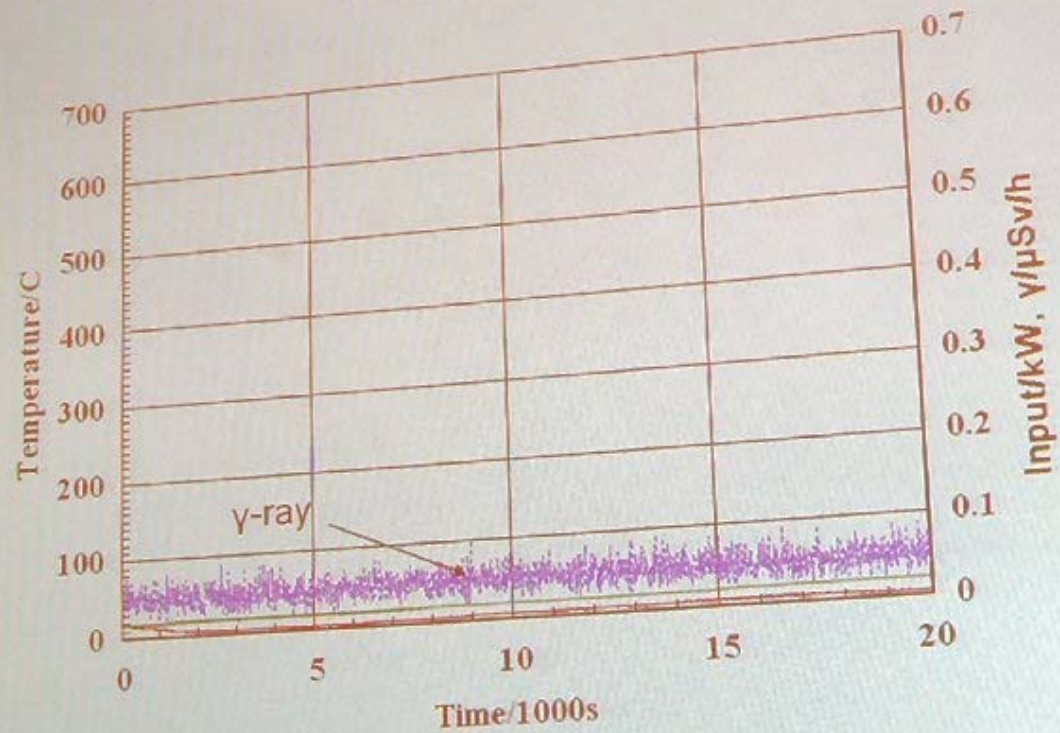
## Contents

- Experimental procedures.  
*Heat, mass, gamma.*
- Results.  
*Heat generation, Gamma emission, Products.*
- Conclusions.  
*Factor of reaction control, Expected reaction mechanism.*

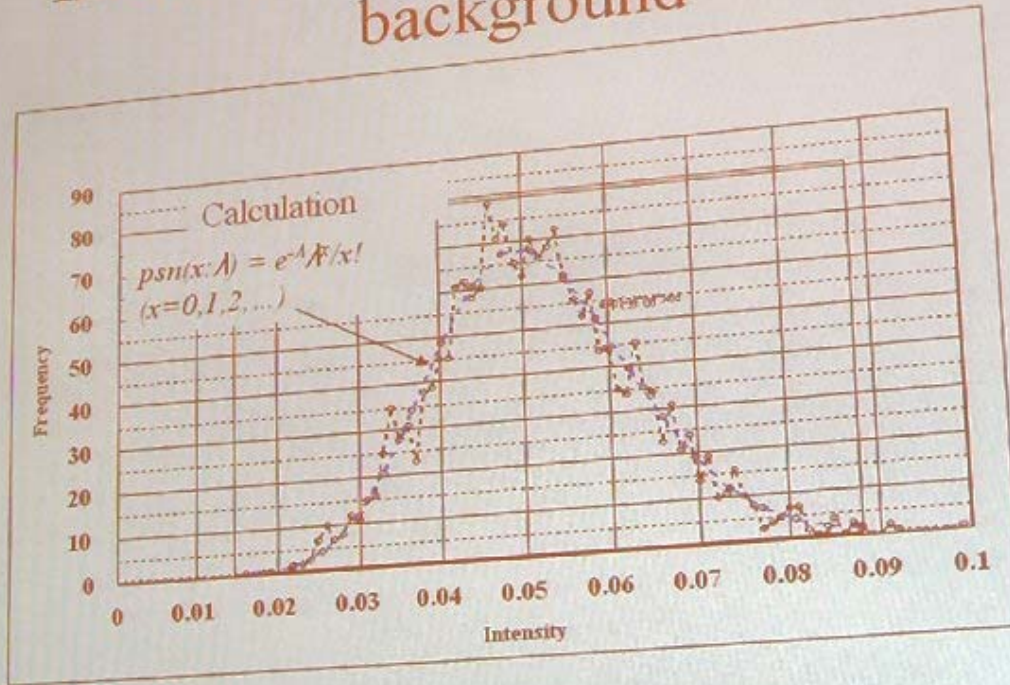
# Experimental set up



# Gamma ray background in vacuum

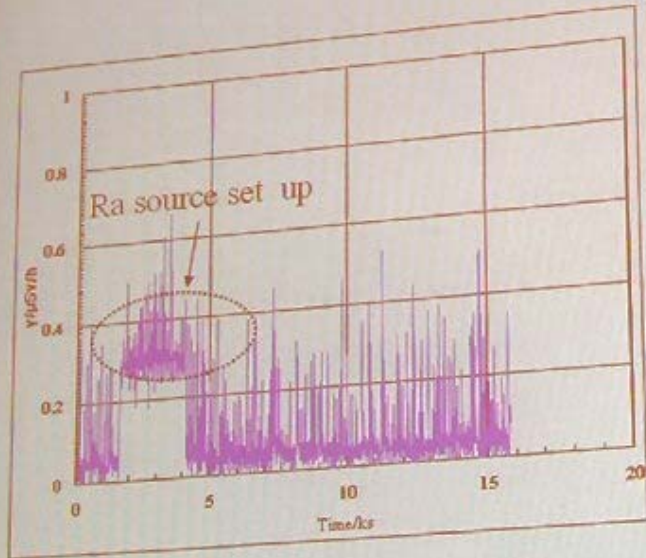


# Intensity distribution of gamma for background

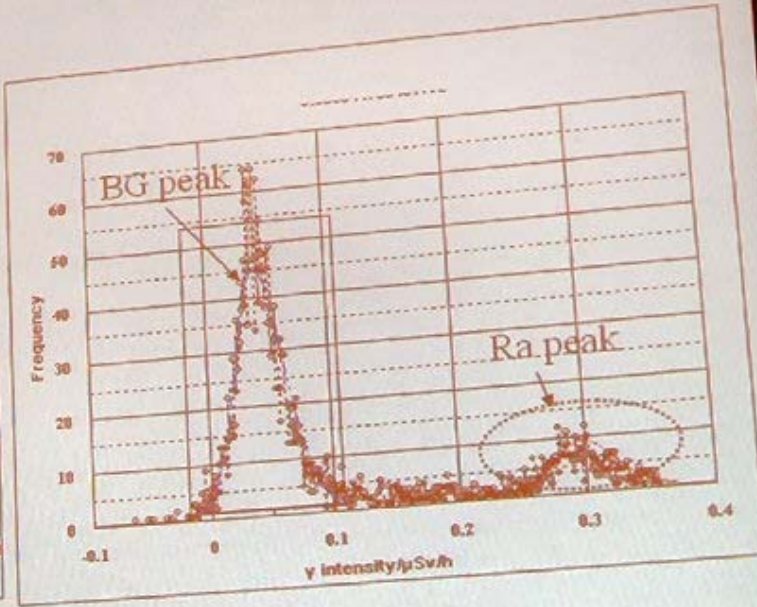


Geiger counter

# Calibration of $\gamma$ emission by Ra source

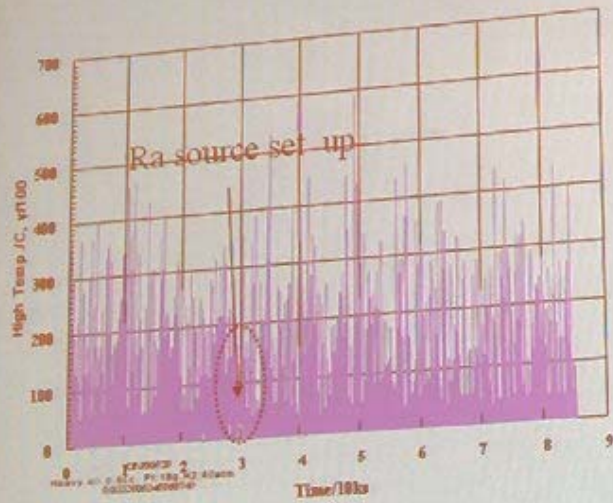


Calibration of gamma emission  
by  $^{226}\text{Ra}$

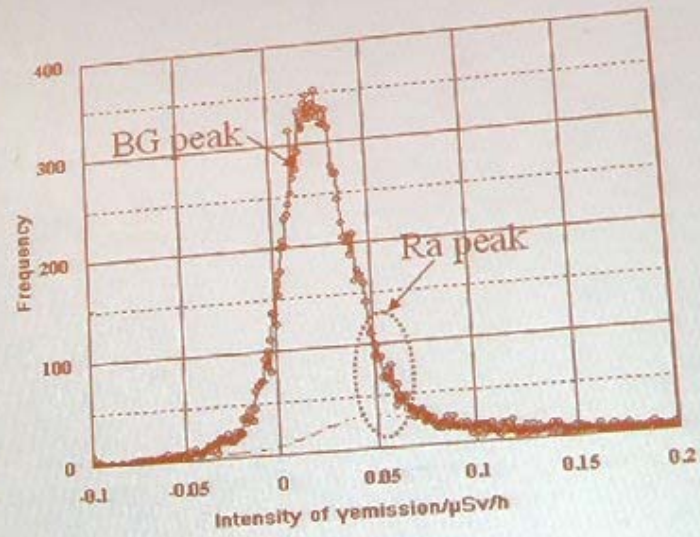


Spectrum of  $\gamma$  emission  
intensity

# Calibration of $\gamma$ emission by Ra source

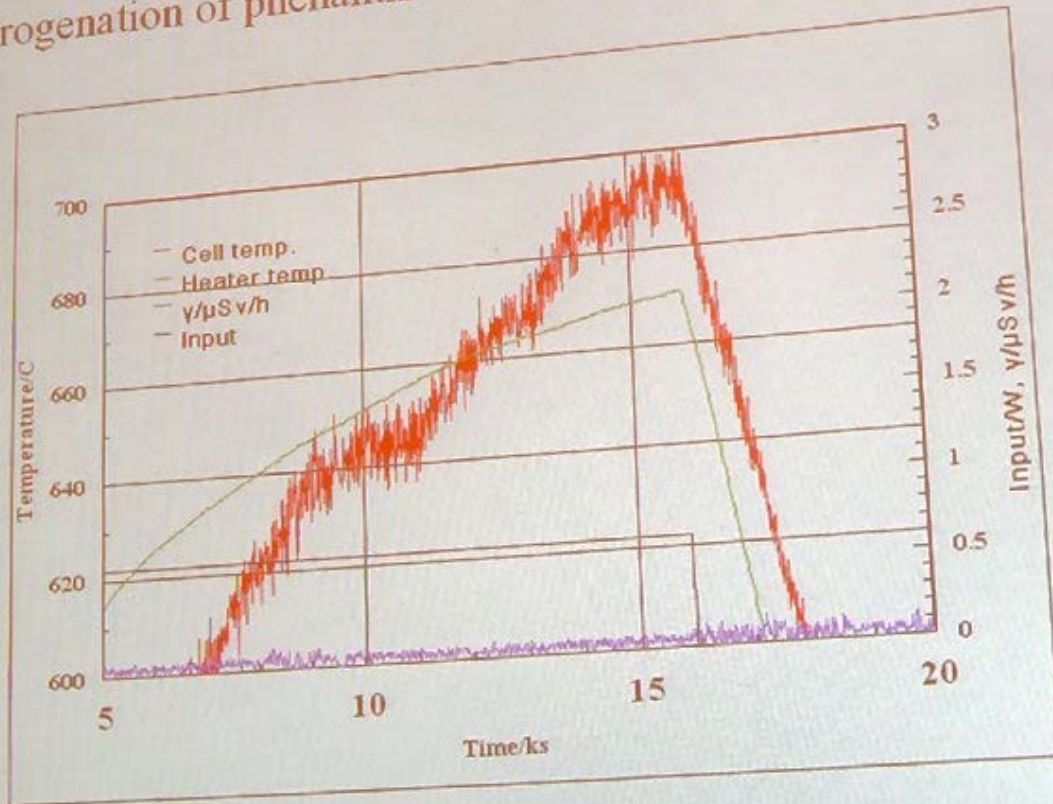


Calibration of gamma emission by  $^{226}\text{Ra}$

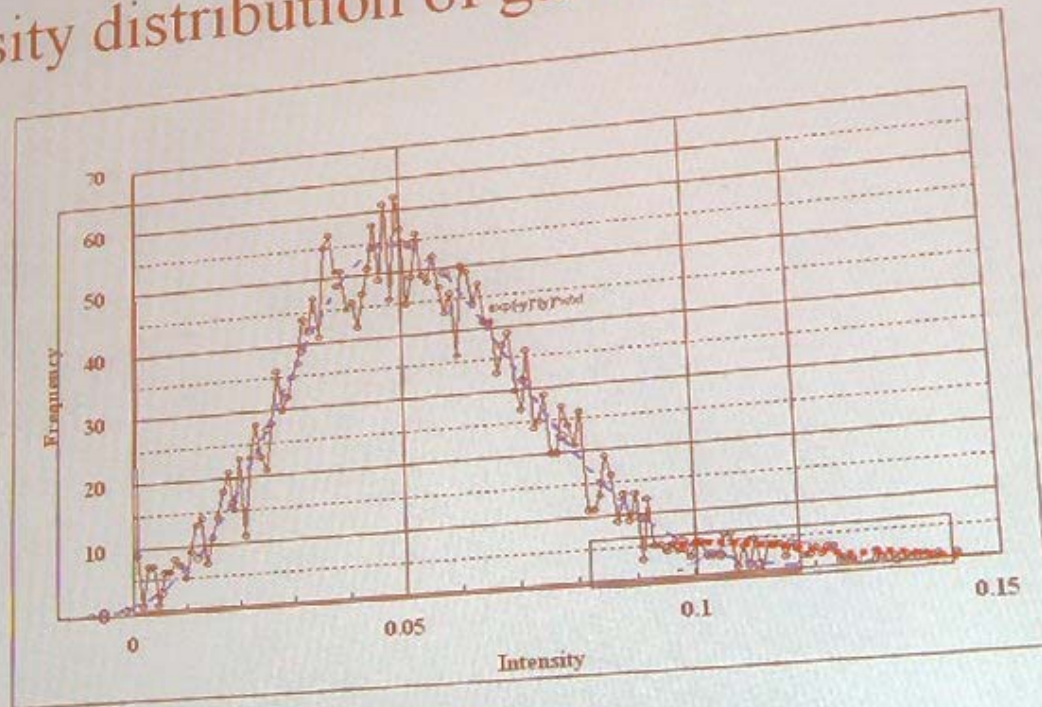


Spectrum of  $\gamma$  emission intensity

Changes of reactor temperature and gamma emission during hydrogenation of phenanthrene (creosote) 1 g, He+H<sub>2</sub>; 70 atm

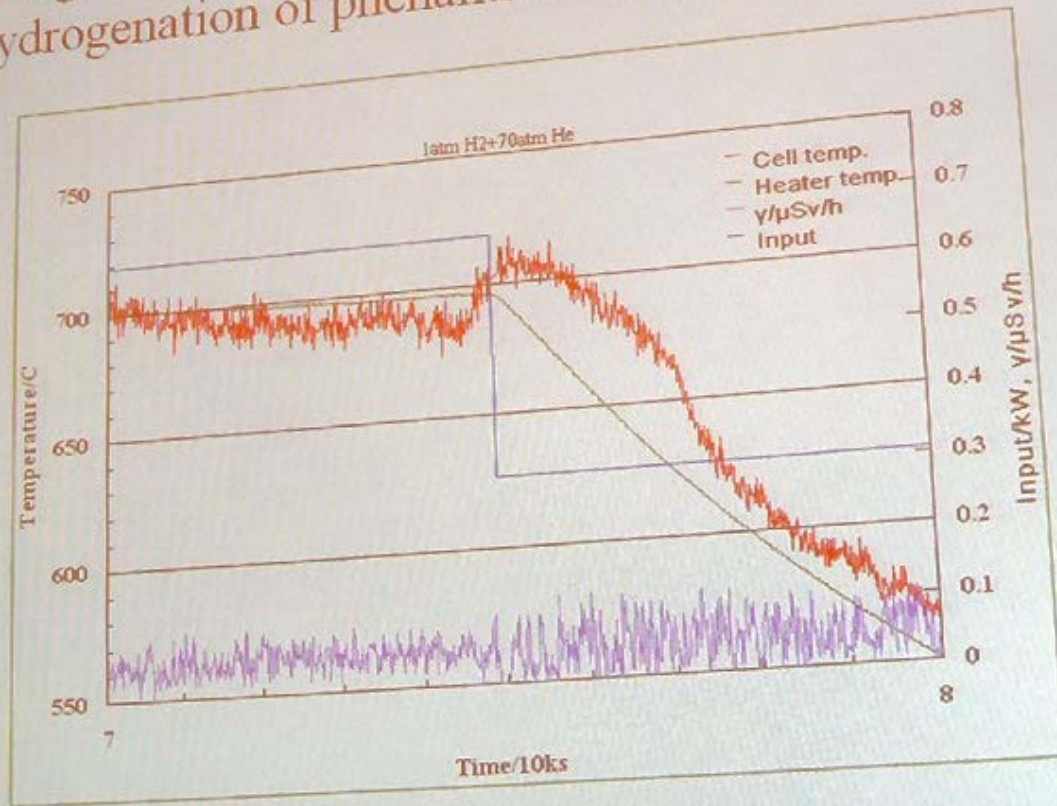


# Intensity distribution of gamma emission

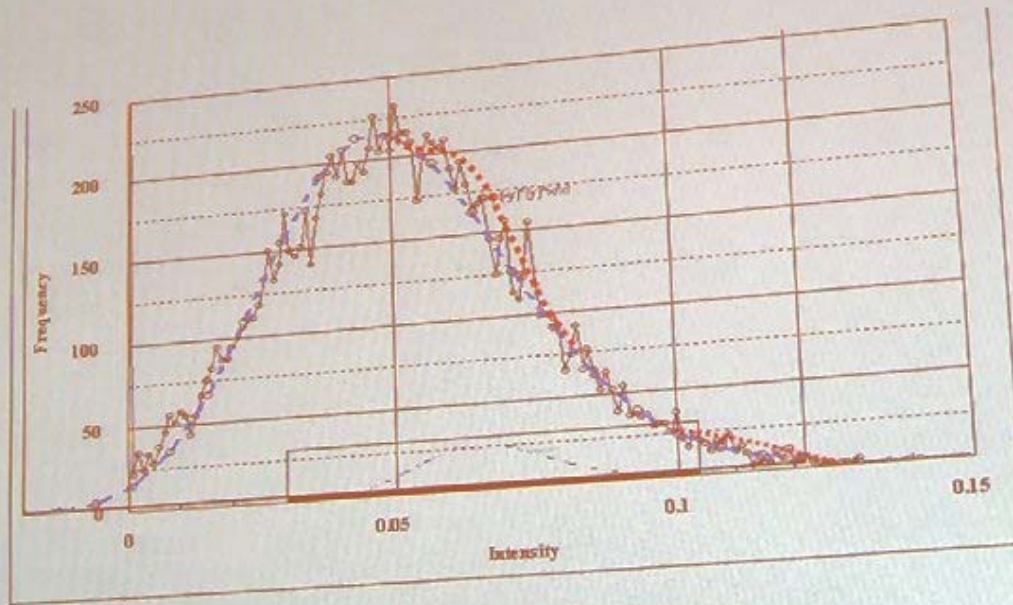


Geiger counter

Changes of temperature and gamma emission during hydrogenation of phenanthrene; 1g, He+H<sub>2</sub>; 70atm

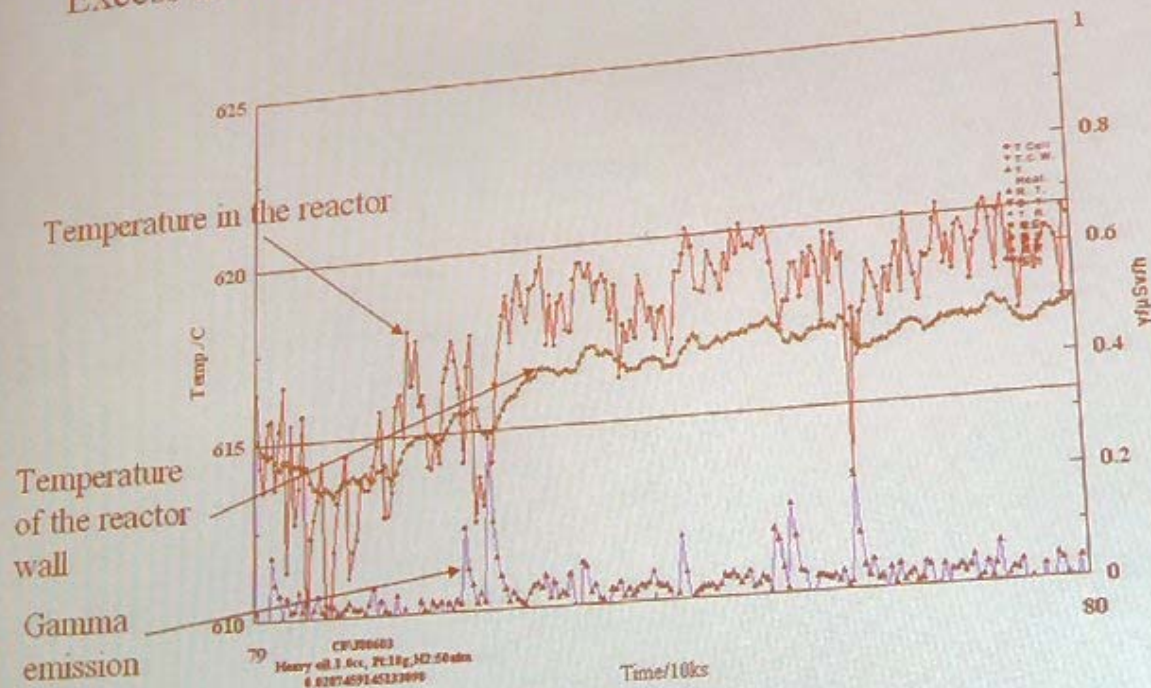


# Distribution of gamma emission

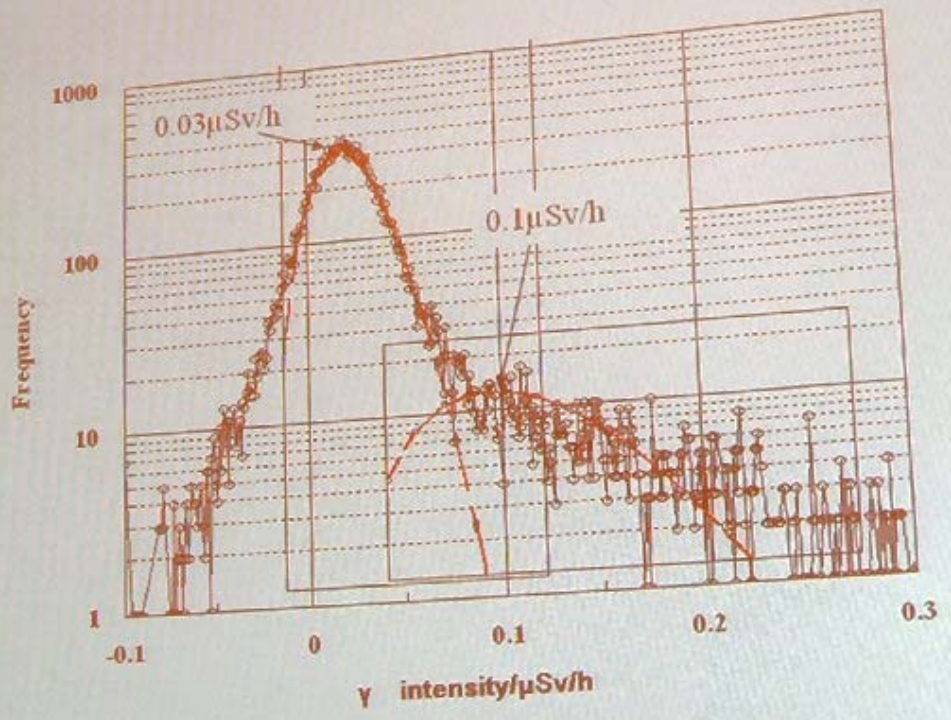


Geiger counter

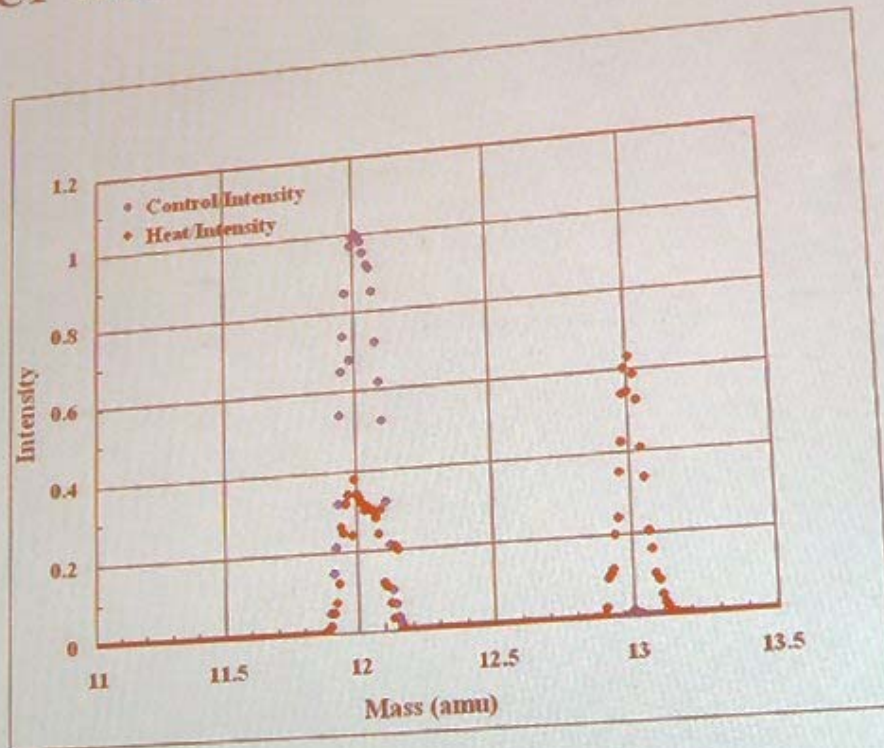
# Excess heat results: changes of temperature and gamma emission



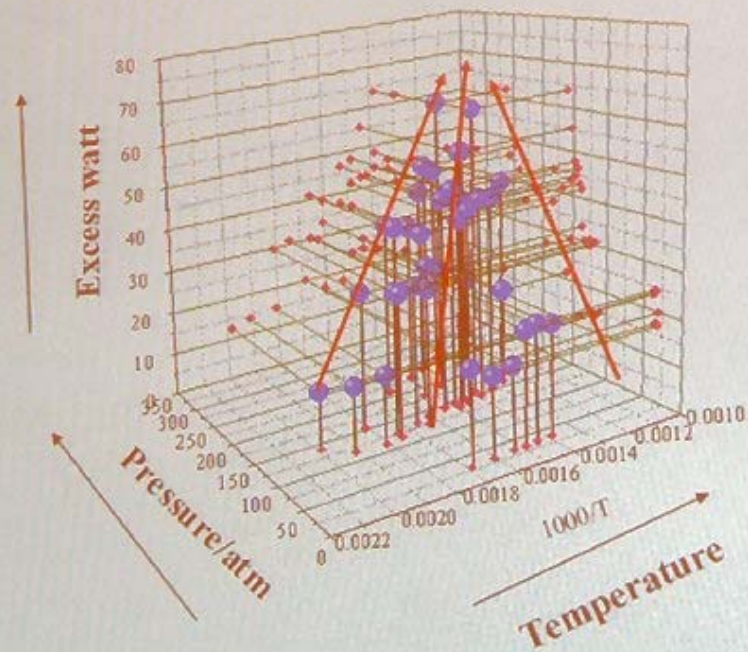
# Intensity distribution of gamma emission



# ICP mass analysis for the Carbon



Three dimensional representation showing dependence of the excess heat on temperature and H<sub>2</sub> pressure



## Conclusions

1. Excess heat was confirmed during heating of phenanthrene in high pressure of H<sub>2</sub> gas.
2. Heat generation is correlated with H<sub>2</sub> pressure and raising the temperature externally.
3. Energy evolution was on the order of 1 W/cm<sup>2</sup> (Pt).
4. Gamma emission was confirmed during the experiment.
5. The M/e=13 component increased in gas generated excess energy.

## Possible Explanation of the Experimental Result

- Increase of  $^{13}\text{C}$  is explained by such a reaction in the solids by absorption of a neutron followed by gamma emission;
- $n + {}^{12}_6\text{C} \rightarrow {}^{13}_6\text{C}^* \rightarrow {}^{13}_6\text{C} + \gamma$ ,
  - $E_\gamma = 4.95 \text{ MeV}$