

20

**From:** Diane Jackson, *NRR*  
**To:** Joseph Staudenmeier *MRP*  
**Date:** 2/27/01 1:43PM  
**Subject:** swedish gov't q's on TWG

Joe - Do you rememeber answering this question? I could not find any response in any file. Could you provide an answer please.

Thanks -Diane

Mats Sjöberg/ Ferenc Müller on report: [Ref. 9] Page A1-7 in the report says:

"When zirconium reaches temperatures where air oxidation is significant, the heat source is dominated by oxidation. The energy of the reaction is 262 kcal per mole of zirconium. In air, the oxidation rate and the energy of the reaction is higher than zirconium-steam oxidation."

We can transfer 262 kcal to other units:

$262 \text{ kcal per mol Zr} = 1.1 \text{ MJ per mol Zr}$  (1 mol Zr = 91.2 kg Zr) =  $1.1\text{E}+06/91.2 = 1.2\text{E}+04 \text{ J/kg Zr}$ . We can conclude that the air oxidaton energi according to the report is =  $1.2\text{E}+04 \text{ J per kg Zr}$

The corresponding values for Zr-steam reaktion in the Melcor manual =  $6.43\text{E}+06 \text{ J/kg Zr}$  (Ref. Bottom Head Package, Reference Manual, Table 3.6. Heats of reaction at 1,700 K) The Maap code uses  $6.18\text{E}+08 \text{ J per mol Zr} = 6.78\text{E}+06 \text{ J/kg Zr}$ , for Zr-steam reaktion i.e. near the same as Melcor.

There is a factor 500 difference in the oxidaton energy and to the wrong direction.

**CC:** Richard Dudley

39  
B/M