

FOI-71  
REQUEST

**From:** Hee Chung <heechung@anl.gov>  
**To:** Charles Tinkler <CGT@nrc.gov>, <SXB2@nrc.gov>  
**Date:** Wed, Aug 23, 2000 1:38 PM  
**Subject:** Re: autoignition

Charles and Sud, how about a version something like below? I will be back in my office about 2:30 PM your time. Hee

Autoignition is known to occur in Zr alloys and Zr hydride, especially when clean metal or hydride is suddenly exposed to air (Reference 8). The temperature of ignition is highly dependent on the ratio of surface area to volume and the degree of surface cleanliness. Generally, spent fuel rod claddings are covered with a relatively thick oxide layer (20-100-micrometer thick) from the beginning, therefore, unless ballooning and burst occur in the cladding during heatup, clean high-temperature Zircaloy metal will not be exposed to air in a spent fuel pool accident. However, if there is cladding failure by ballooning and burst (expected to occur over a temperature range of 700-850 °C), hot oxide-free clean metal will be abruptly exposed to air. Zr hydride is expected to dissolve into the metal matrix during the slow heatup to these temperatures. At the moment of burst, a clean surface area of Zr metal approximately equal to the cross section of the cladding tube will be exposed to air. Although information applicable to this situation is hardly available, considering the relatively small surface-to-volume ratio of the exposed metal, likelihood of ignition and subsequent propagation of the burning front of Zr metal is believed to be small.

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