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# NASA TECH BRIEF



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## Heat Transfer Coefficients for Liquid Hydrogen Turbopumps

There are numerous complex modes of heat transfer that occur during transient startup operation of liquid hydrogen turbopumps. Empirical equations have been derived to establish the appropriate heat transfer coefficients as functions of the temperature drops and heat transfer rates for a wide range of convective and boiling conditions at different locations in a liquid hydrogen turbopump.

### Note:

Documentation for the innovation is available from:

Clearinghouse for Federal Scientific  
and Technical Information  
Springfield, Virginia 22151  
Price \$3.00  
Reference: B68-10517

### Patent status:

No patent action is contemplated by NASA.

Source: W. R. Wagner and W. R. Bissel  
of North American Rockwell Corporation  
under contract to  
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Category 02



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## High Temperature Oxidation of Polyethylene Glycol

Technical Report

This report describes the results of a study of the high temperature oxidation of polyethylene glycol (PEG) in air. The study was conducted at temperatures ranging from 200°C to 400°C. The results show that the rate of oxidation increases with temperature and that the products of oxidation are primarily carbon dioxide and water. The study also shows that the oxidation of PEG is a first-order reaction with respect to the concentration of PEG.

1. Introduction  
2. Experimental  
3. Results  
4. Discussion  
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