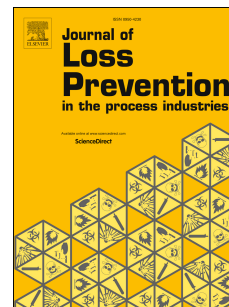


Accepted Manuscript

Radiative fraction of dust entrained turbulent premixed flames

Sreenivasan Ranganathan, Scott R. Rockwell, David Petrow, Robert Zalosh, Ali S. Rangwala



PII: S0950-4230(17)30749-0

DOI: [10.1016/j.jlp.2017.11.009](https://doi.org/10.1016/j.jlp.2017.11.009)

Reference: JLPP 3623

To appear in: *Journal of Loss Prevention in the Process Industries*

Received Date: 23 August 2017

Revised Date: 20 November 2017

Accepted Date: 20 November 2017

Please cite this article as: Ranganathan, S., Rockwell, S.R., Petrow, D., Zalosh, R., Rangwala, A.S., Radiative fraction of dust entrained turbulent premixed flames, *Journal of Loss Prevention in the Process Industries* (2017), doi: 10.1016/j.jlp.2017.11.009.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Radiative Fraction of Dust Entrained Turbulent Premixed Flames

Sreenivasan Ranganathan^{1,*}, Scott R. Rockwell³, David Petrow¹, Robert Zalosh¹,
Ali S. Rangwala¹

¹Department of Fire Protection Engineering, Worcester Polytechnic Institute, 50 Prescott Street
(Gateway Park II), Worcester, MA 01609, USA

³Department of Engineering Technology and Construction Management, University of North
Carolina at Charlotte, 9201 University City Blvd, Charlotte, NC 28223, USA

*Corresponding Author Email: sranganathan@wpi.edu

Manuscript accepted for publication in Journal of Loss Prevention in the Process Industries.

Article type: Full length article

Abstract:

The aim of this paper is to estimate the radiative fraction of heat released by methane-air-dust turbulent premixed flames and to study the effect of dust particles (75-90 μm) on the radiative heat released. Radiative heat flux measurements were captured from burner stabilized methane-air-dust premixed flames at different equivalence ratios ($\phi_g = 0.8, 1.0, 1.2$), and turbulent intensities ($u'_{rms} = 0.65, 0.72, 0.88$ m/s) using different dust types (coal, sand and sodium bicarbonate) and dust concentrations ($\lambda_p = 25, 50, 75$ g/m³). The effect of these parameters on the resulting radiative fraction of heat released (X_r) was investigated. It was identified that the addition of dust particles increase the radiative fraction irrespective of the dust type due to the radial and axial extension of flame. An increase in the turbulent intensity decreases the radiative fraction. Addition of coal dust results in the maximum value of radiative fraction of heat released, whereas sand and sodium bicarbonate results in approximately similar average radiative fraction values. With the addition of coal dust, the radiative fraction of premixed methane-air flames become comparable to that of methane-air diffusion flames. The range of radiative fractions of methane-air gaseous turbulent premixed flame is found to be 2.7% - 6%, whereas the addition of coal, sand and sodium bicarbonate results in an increased range of X_r values of 10.5% - 17.5%, 7.6% - 11.5%, and 8.5% - 12.7% respectively.

Keywords: *Radiation; Radiative fraction; Dust; Premixed Flame; Turbulent.*

Download English Version:

<https://daneshyari.com/en/article/6972929>

Download Persian Version:

<https://daneshyari.com/article/6972929>

[Daneshyari.com](https://daneshyari.com)