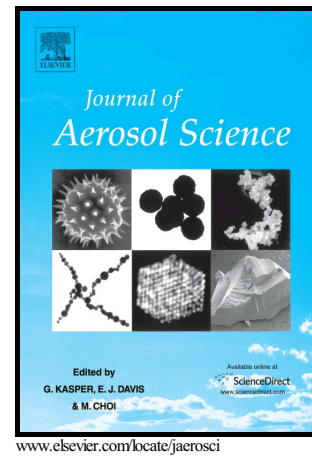


# Author's Accepted Manuscript

Effect of shielding gas temperature on the welding fume particle formation: Theoretical model

V.I. Vishnyakov, S.A. Kiro, M.V. Oprya, A.A. Ennan



PII: S0021-8502(17)30477-9  
DOI: <https://doi.org/10.1016/j.jaerosci.2018.07.006>  
Reference: AS5317

To appear in: *Journal of Aerosol Science*

Received date: 11 December 2017  
Revised date: 22 May 2018  
Accepted date: 23 July 2018

Cite this article as: V.I. Vishnyakov, S.A. Kiro, M.V. Oprya and A.A. Ennan, Effect of shielding gas temperature on the welding fume particle formation: Theoretical model, *Journal of Aerosol Science*, <https://doi.org/10.1016/j.jaerosci.2018.07.006>

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 galley proof before it is published in its final citable 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.

# Effect of shielding gas temperature on the welding fume particle formation: Theoretical model

V.I. Vishnyakov\*, S.A. Kiro\*, M.V. Oprya\*, A.A. Ennan\*

*Physical-Chemical Institute for Environment and Human Protection of Min Edu Sci and Natl Acad Sci Ukraine, 3 Preobrazhenska st., Odessa UA-65082, Ukraine*

---

## Abstract

Inhalable particles formation in gas metal arc welding with various shielding gas temperatures is investigated by fume evolution numerical modeling. The subject of modeling is a single gas parcel of vapor-gas mixture, evolution of which under cooling based on initial temperature and vapor chemical composition is calculated. The welding fume evolution includes vapor emission from arc zone and mixing, plasma formation, nucleation, nuclei growth via material condensation and coalescence, solidification of liquid droplets and primary particles' coagulation into inhalable particles in the breathing zone. The computed results correlates well with experimental dependency of the particle sizes on the shielding gas temperature. Such a dependency is caused by the decrease of vapor-gas mixture cooling rate when the shielding gas temperature is increased, which provides the increase of particles' growth duration which leads to increase of the particle sizes.

*Keywords:* Gas metal arc welding, Numerical modeling, Particle size distribution, Shielding gas temperature

---

\*Corresponding author. Tel.: +380 487237528; fax: +380 487231116.

*Email address:* [dr.v.vishnyakov@gmail.com](mailto:dr.v.vishnyakov@gmail.com), [eksvar@ukr.net](mailto:eksvar@ukr.net) (V.I. Vishnyakov)

Download English Version:

<https://daneshyari.com/en/article/8865206>

Download Persian Version:

<https://daneshyari.com/article/8865206>

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