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CGA G-1—2021
ACETYLENE

FOURTEENTH EDITION

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Work Item 20-014
Acetylene Committee

NOTE—Technical changes from the previous edition are underlined.

FOURTEENTH EDITION: 2021
THIRTEENTH EDITION: 2015
TWELFTH EDITION: 2009
ELEVENTH EDITION: 2003
TENTH EDITION: 2001
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1 Introduction

This publication is one of a series compiled by the Compressed Gas Association, Inc. (CGA) to satisfy the demand for information relative to the production, transportation, handling, and storage of compressed gases. NFPA 55, *Compressed Gases and Cryogenic Fluids Code,* provides information relative to the manufacture, handling, and storage of acetylene by cylinder charging plants [1].[1]

2 Scope

This publication presents general information on the characteristics of acetylene and its handling. Requests for specialized technical information should be directed to the manufacturers of this gas.

The following references may also be useful to acetylene users:

- NFPA 51, *Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes* [2];
- NFPA 51B, *Standard for Fire Prevention During Welding, Cutting, and other Hot Work* [3];
- ANSI/AWS Z49.1, *Safety in Welding and Cutting and Allied Processes* [4]; and
- CGA G-1.11, *Guideline for Handling Acetylene Cylinders and Ancillary Equipment in Fires* [5].

3 Acetylene

3.1 Composition

Acetylene is a compound of the elements carbon and hydrogen. Its composition is expressed by the chemical symbol C_2H_2. On a weight basis, the proportion of the elements in acetylene is approximately 12 parts of carbon to 1 part of hydrogen, or 92.3% to 7.7%, respectively.

3.2 Physical and chemical properties

At atmospheric temperatures and pressures, acetylene is a colorless gas that is slightly lighter than air. Acetylene of 100% purity is odorless, but acetylene of ordinary commercial purity has a distinctive, garlic-like odor. Some physical constants of acetylene are given in Table 1.

Acetylene burns in air with an intensely hot, luminous, and smoky flame. The ignition temperatures of acetylene and mixtures of acetylene with air or acetylene with oxygen will vary according to composition, pressure, water vapor content, and initial temperature. As a typical example, mixtures containing 30% acetylene by volume with air at atmospheric pressure can be ignited at approximately 581 °F (305 °C). The flammable limits of mixtures of acetylene with air and acetylene with oxygen will depend on the initial pressure, temperature, and water vapor content. In air at atmospheric pressure, the upper limit of flammability is approximately 81% acetylene in air. The lower limit is 2.5% acetylene in air.

Acetylene can be liquefied and solidified with relative ease, but both liquid and solid acetylene are unstable. Liquefied acetylene has a higher shock sensitivity and energy density than compressed gaseous acetylene. Thus, the liquefaction of acetylene shall be absolutely avoided. Figure 1 presents the vapor pressure curve for acetylene. Maintaining the pressure-temperature combination of acetylene below the curve will keep acetylene in the gaseous phase. Note that at low temperatures, acetylene could liquefy at common operating pressures.

[1] References are shown by bracketed numbers and are listed in order of appearance in the reference section.