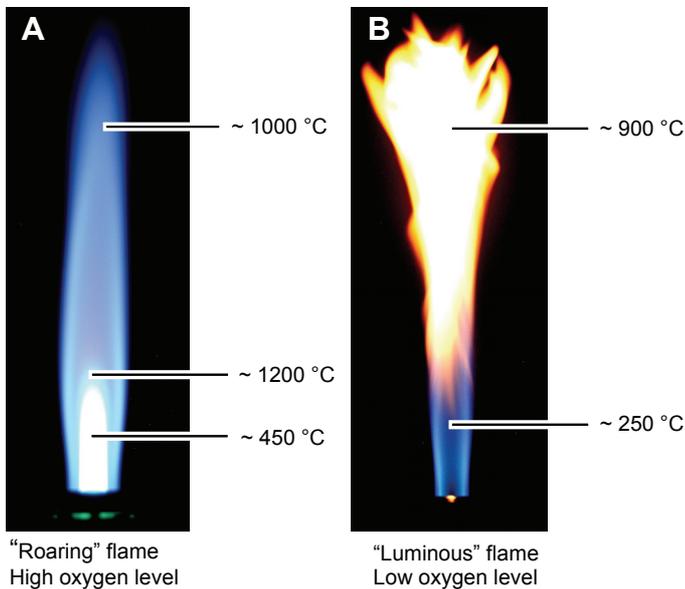


## Modern Bunsen burners

### Introduction

Flame sterilization is a routine task carried out in many microbiological, clinical and life science laboratories. Bunsen burners provide a flame with temperatures up to 1'200°C. Natural gas (primarily methane), liquefied petroleum gas such as propane, butane or a mixture of both are used as fuels. The gas flows through a small opening at the base of the barrel and is directed upwards. Air vents at the tube bottom permit air to enter the gas stream by the Venturi effect. The amount of oxygen (air) mixed with the gas stream defines the completeness of the combustion reaction. Thus, a gas stream well mixed with oxygen results in a complete and hotter reaction than with less oxygen. The air rich flame appears blue and creates a roaring noise whereas an incomplete combustion results in a noiseless and yellow flame (see figure below). The highest temperature within the blue flame is obtained at the tip of the inner cone. Thus, for efficient annealing, the object has to be inserted at this position.



Flame with high (A) and low (B) oxygen level and its corresponding temperature profile.

### Inherent risks of conventional Bunsen burners

Traditionally Bunsen burners have been used as the standard equipment for routine flame sterilization work. However, the danger of working with alcohol burners, ordinary gas cookers or traditional Bunsen burners connected to a gas

distribution system should not be underestimated. A major source of danger is posed by leaking systems, causing highly flammable gas to escape. Furthermore, accidents are caused by unattended burners and the fact that the hot blue flame is often barely visible.

Accidents caused by burners are relatively rare, but when they do occur they are often devastating, resulting in severe injuries or fires. No wonder, safety officers are keen to encourage laboratory staff to avoid open flames whenever possible.

### There is a safe alternative!

Safety Bunsen burners were developed to reduce dangers as described above. The following features make them safe burners:

- **Flame monitor**

To prevent dangerous gas leakage, safety Bunsen burners automatically try to reignite the flame if it accidentally extinguishes. Should it for any reason fail to do so, safety burners will interrupt the gas supply reliably.
- **User-defined maximum burning time**

An automatically shut off after a user-defined maximum burning time, eliminates any danger if the Bunsen burner is unintentionally left on. Moreover, a short burning time reduces the risk of burns.
- **Alarm display feature**

An alarm display on the graphical user interface indicates that the burner head is still hot in order to protect the operator from burns.



Typical safety Bunsen burner operated with a gas cartridge. This burner offers users the choice to ignite the flame by an infrared optical sensor, a foot switch or a push button on the instrument.