Microbridges, also known as microglows or micro-filaments, are miniature silicon fila-
m ents that are used e.g. in analysers as light sources. A microbridge is brought up to
incandescence by passing an electrical current through it. Temperature determination of
an operating microbridge with a contact measurement is complicated due to the small size
of the bridge and the heat loss via the contact probe.

In this work, we have developed
and tested a method to determine
the temperature of a microbridge by
measuring its emission spectrum.
The measurement setup consists of
a monochromator, detectors for the
visible and near-infrared spectral
regions and focusing optics based
on a microscope objective. The
setup was used to measure temper-
atures of microbridges that have di-
mensions of $400 \times 20 \times 4 \, \mu\text{m}^3$.
They are made from a highly doped
single-crystal silicon. The bridges
have thin protecting layers of sili-
con dioxide on all sides.

Determination of the temperature is possible using Planck’s radiation law if the emissivity
of the object is known. Emissivity of silicon at high temperatures is often assumed to be
constant in the visible and near-infrared regions. However, a microbridge is thin and thus
semi-transparent. The thin layers of silicon dioxide also introduce interference effects.
As a consequence, microbridges do not behave like grey bodies (Fig. 1). To solve this
problem, a semi-empirical model was constructed to describe the emissivity of the multi-
layer structure. To determine the optical constants of silicon needed, radiation spectra of
a piece of SOI wafer were measured at known temperatures. In particular, the extinction
coefficient of the highly doped silicon at high temperatures in the near-infrared region
was not found in the literature and was determined from the measurements. The results
were fitted to the emissivity model. At present, we can measure the temperature with an
uncertainty of $\pm 50 \, \text{K}$.