Supporting Information

Thomas et al. 10.1073/pnas.0902476106

SI Text

Additional Experimental Information. Nitrocellulose (11.8–12.2% N) was obtained from Scientific Polymer Products (Catalog no. 711). All metallic salts were obtained from either Alfa Aesar or Sigma-Aldrich in the highest available purity. The emission spectra of rubidium and cesium salts with purity <99.5% showed contamination from lighter alkali metals. The surfactant Surfynol 440 was obtained from Air Products. All aqueous solutions were prepared with water purified and deionized by a Millipore system.

Fuses burned most reliably in a vertical orientation and held at the bottom (in our experiments, with a small alligator clip). Fuses thinner than ≈100 μm and longer than ≈10 cm could not stay upright, and so were supported in several places with copper wire. Fuses thicker than ≥100 μm and up to 20 cm long supported their own weight when lit.

Movies of burning infofuses were acquired with an RGB CCD camera (Epix) at 1,000 frames per second equipped with a fisheye lens and a notch optical filter (FWHM ≈ 10 nm) to exclude the background emission from sodium (λ = 589 nm).

A filter-based detection system was used to acquire signals from as far as 300 m from the burning fuse and to acquire signals from lower quantities of deposited salts (≈200 pg). Light was collected by a telescope consisting of 2 convex lenses. After the second lens, a dichroic mirror deflected visible light to a series of lenses used for imaging, so that the system could be aimed at the fuse. The remainder of the light passed through the dichroic mirror and to a set of long- and short-pass filters. These filters attenuated the light outside of the 700- to 900-nm range. The light was then split into 3 paths by 2 dichroic mirrors. The first dichroic mirror deflected light with wavelengths <773 nm along path A. The second dichroic mirror split the remaining light by deflecting light with wavelengths <815 nm along path B and allowing light with longer wavelengths to continue along path C. In each path, a series of interference filters with bandpasses of ≈1 nm selected for the light corresponding to atomic emission (K at 767 nm for path A, Rb at 780 nm for path B, and Cs at 852 nm for path C) and focused this light onto a detector (Si femtowatt photoreceiver, Thorlabs). The data were read with LabView by using a National Instruments USB-6009. Filters were purchased from Thorlabs and Spectrofilm.

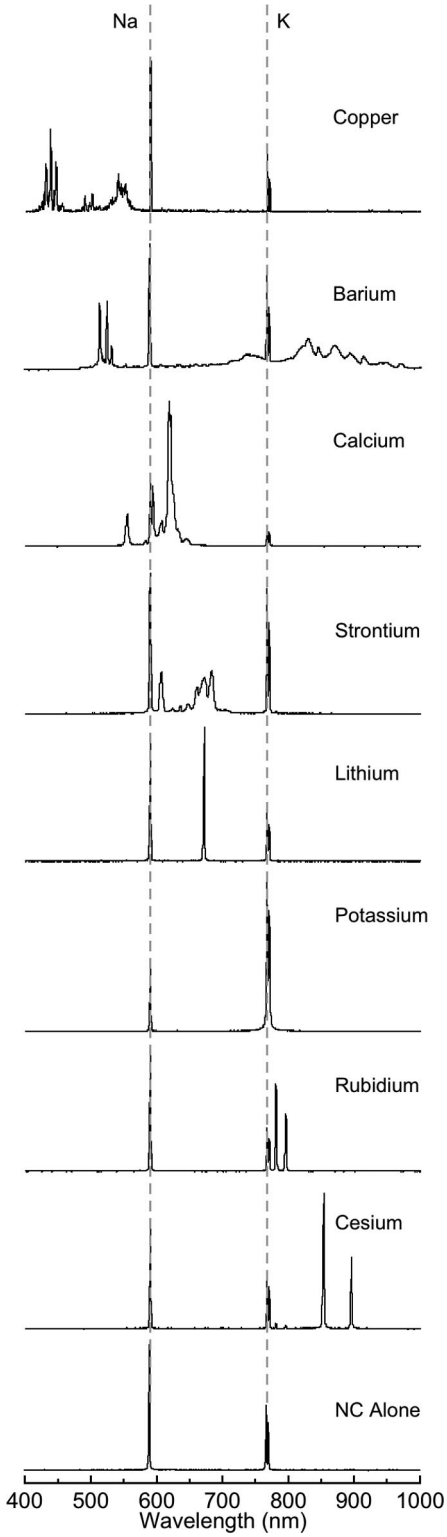

Fig. S1. Emission spectra of burning films of nitrocellulose with metal perchlorate salts adsorbed onto them. Dotted lines indicate background emission (sodium and potassium atoms) from the nitrocellulose.

	Pulse 1 (Li, Rb, Cs)	Pulse 2 (Li, Rb, Cs)
A	(0, 1, 0)	(0, 0, 1)
B	(1, 1, 0)	(0, 1, 0)
C	(1, 1, 0)	(0, 0, 1)
D	(0, 1, 1)	(1, 0, 0)
E	(1, 0, 0)	(0, 1, 0)
F	(1, 0, 0)	(1, 0, 1)
G	(0, 1, 0)	(1, 1, 0)
H	(0, 1, 0)	(1, 0, 1)
I	(1, 0, 0)	(0, 0, 1)
J	(0, 1, 1)	(0, 1, 0)
K	(1, 0, 1)	(0, 0, 1)
L	(1, 0, 1)	(0, 1, 0)
M	(0, 1, 0)	(0, 1, 1)
N	(0, 0, 1)	(0, 1, 0)
O	(0, 1, 0)	(1, 0, 0)
P	(0, 1, 1)	(0, 0, 1)
Q	(0, 0, 1)	(0, 0, 1)
R	(1, 0, 0)	(0, 1, 1)
S	(0, 0, 1)	(1, 1, 0)
T	(0, 0, 1)	(1, 0, 0)
U	(1, 0, 0)	(1, 1, 0)
V	(1, 0, 1)	(1, 0, 0)
W	(0, 0, 1)	(1, 0, 1)
X	(1, 1, 0)	(1, 0, 0)
Y	(0, 0, 1)	(0, 1, 1)
Z	(0, 1, 0)	(0, 1, 0)

	Pulse 1 (Li, Rb, Cs)	Pulse 2 (Li, Rb, Cs)
0	(1, 0, 1)	(1, 1, 1)
1	(1, 1, 0)	(1, 0, 1)
2	(1, 0, 1)	(1, 1, 0)
3	(0, 1, 1)	(1, 1, 0)
4	(1, 1, 0)	(0, 1, 1)
5	(1, 0, 1)	(0, 1, 1)
6	(0, 1, 1)	(1, 0, 1)
7	(1, 0, 1)	(1, 0, 1)
8	(1, 1, 0)	(1, 1, 0)
9	(0, 1, 1)	(0, 1, 1)
.	(1, 1, 1)	(1, 0, 0)
!	(1, 1, 1)	(0, 1, 0)
?	(1, 1, 1)	(0, 0, 1)
@	(1, 1, 1)	(0, 1, 1)

Fig. S2. Encoding scheme for alphanumeric characters using the emission wavelengths of lithium, rubidium, and cesium. Two consecutive pulses represent each character, with each pulse comprising one, two, or three of the alkali metals. In this encoding scheme, combinations of pulses that are least likely to be interpreted erroneously (sequential pulses using different wavelengths) represent the most commonly used letters in the English language.