

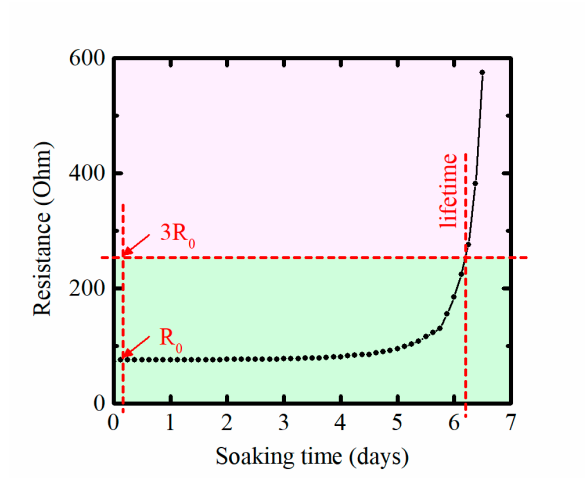


Figure S1. The lifetime definition is based on the resistance test. The green background area indicates that the Cu meanders are still intact, while the red background zone means that the Cu meander has failed.

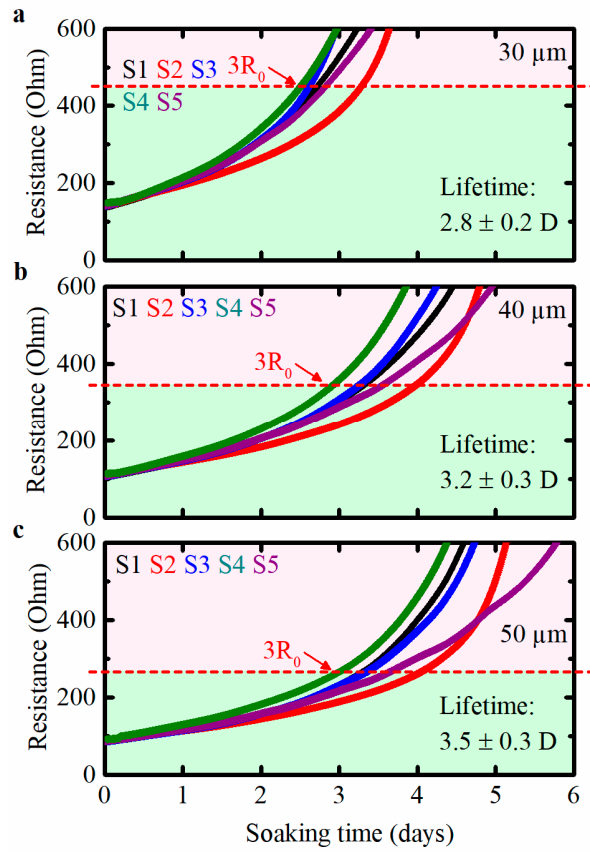


Figure S2. Bare Cu meander samples with different widths soaked in PBS at 28 °C: a. 30 μm , b. 40 μm , c. 50 μm . Each curve indicates one sample, each test has five identical samples.

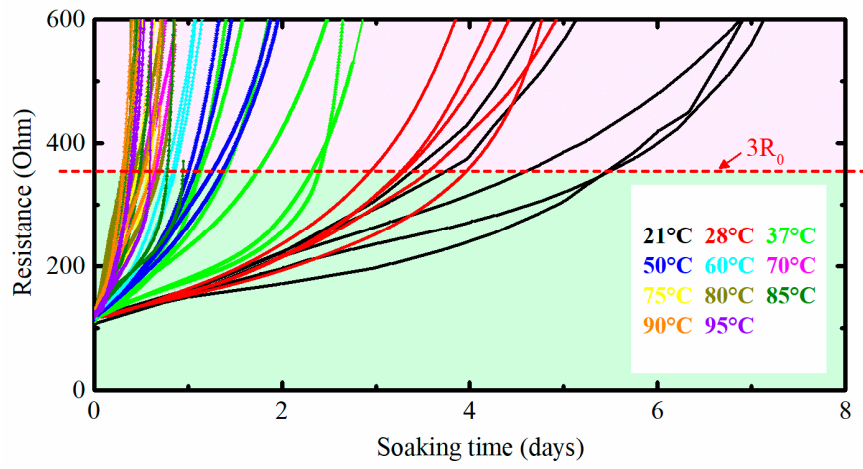


Figure S3. Lifetime of bare Cu meanders soaking in PBS up to 95 °C. Each curve indicates an independent sample.

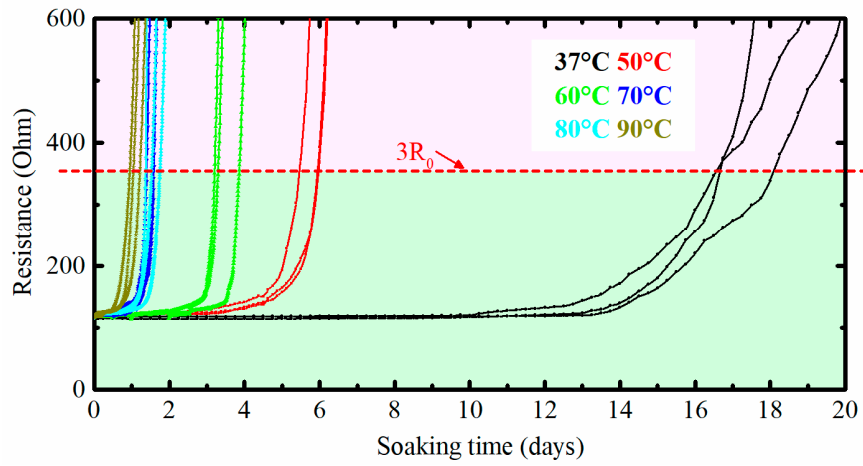


Figure S4. Lifetime of 20 nm ALD Al₂O₃ protected Cu meanders soaking in PBS up to 90 °C. Each curve indicates an independent sample.

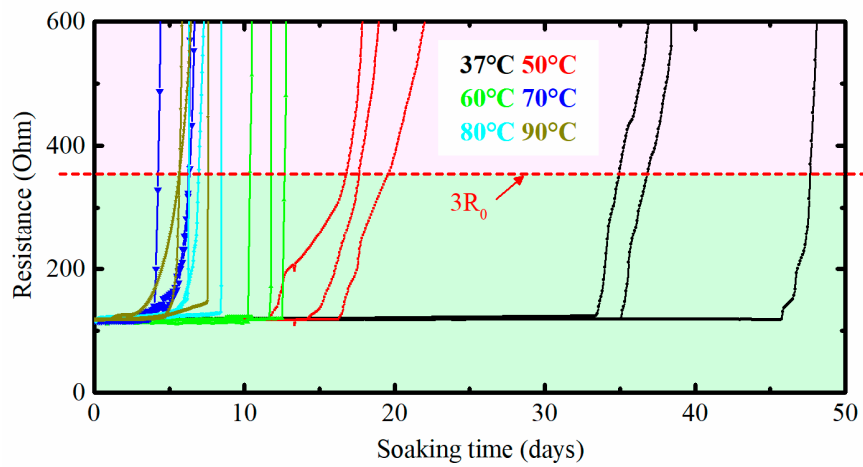


Figure S5. Lifetime of ALD 8nm HfO₂/20 nm Al₂O₃/8 nm HfO₂ protected Cu meanders soaking in PBS up to 90 °C. Each curve indicates an independent sample.

Table S1. Average lifetime (days) of Cu meanders soaking in PBS

Temperature [°C]	Bare Cu Meanders	Al ₂ O ₃ Coated Cu Meanders	ALD-3 Coated Cu Meanders
21	4.70 ± 1.41	-	-
28	3.42 ± 0.34	-	-
37	1.80 ± 0.56	17.38 ± 0.65	39.46 ± 5.96
50	1.21 ± 0.15	5.76 ± 0.26	16.98 ± 1.55
60	0.80 ± 0.04	3.50 ± 0.29	10.74 ± 0.34
70	0.57 ± 0.07	1.57 ± 0.09	5.61 ± 1.03
75	0.49 ± 0.09	-	-
80	0.57 ± 0.14	1.55 ± 0.13	7.18 ± 0.77
85	0.65 ± 0.22	-	-
90	0.66 ± 0.26	1.10 ± 0.08	6.98 ± 1.34
95	0.61 ± 0.21	-	-