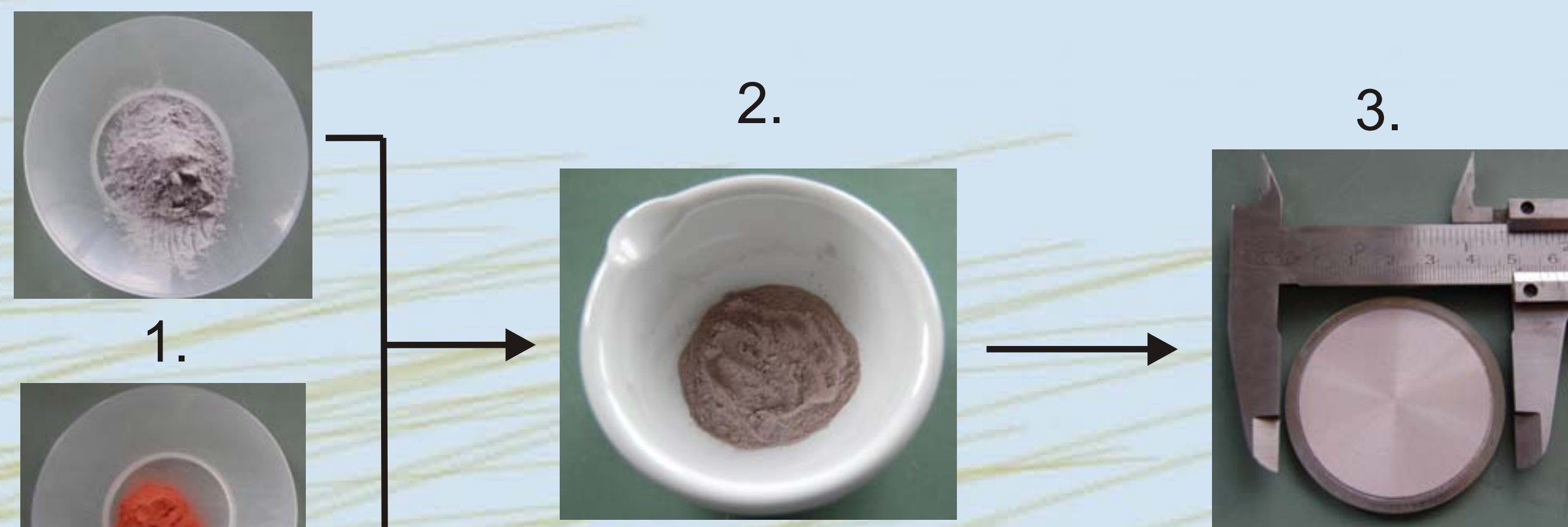


Powder mixtures as deposition targets for multicomponent thin films: a case study

Copper and aluminium powders were mixed in different quantities to obtain several target compositions. These mixtures were cold isostatic pressed into two mm thick disks and used as targets for depositions in both metallic as fully poisoned mode. Furthermore, hysteresis measurements were carried out in order to investigate their behaviour when exposed to a changing oxygen flow.



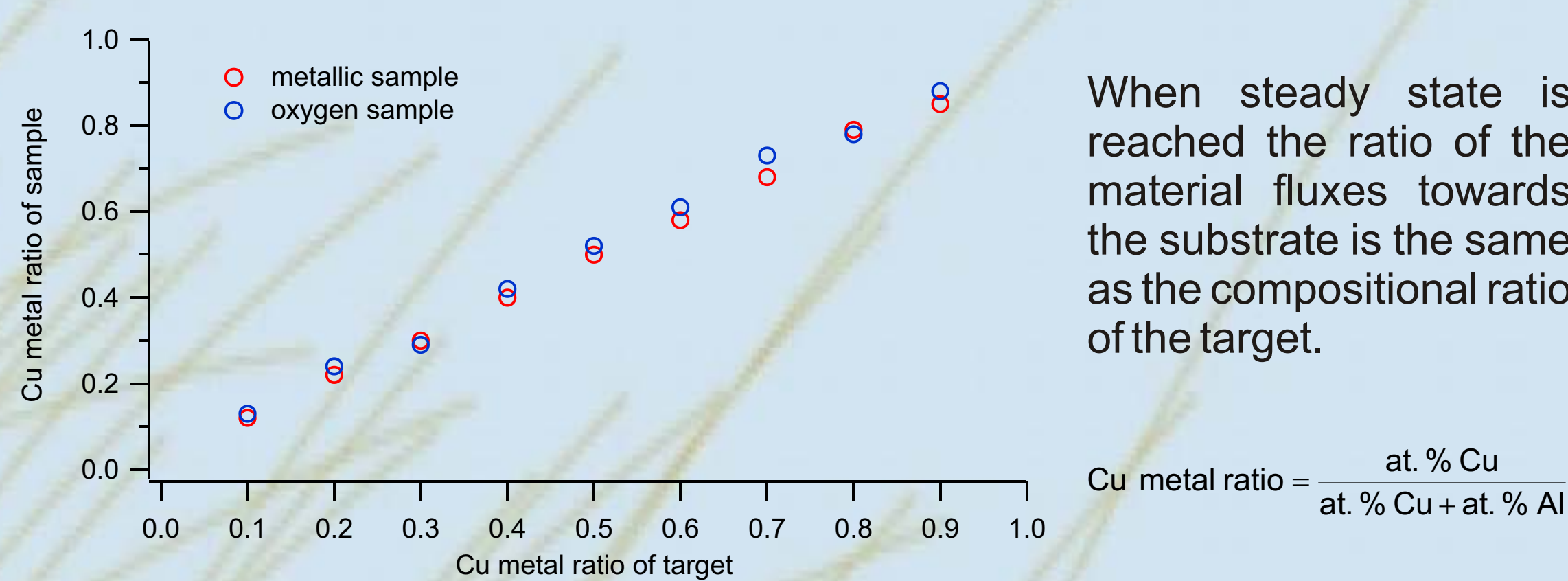
Preparation of the targets:

1. Weighing the desired amount of material.
2. Manually mixing both components.
3. Isostatic pressing of the mixture.

Target compositions ranging from 10 at. % Cu and 90 at. % Al to 90 at. % Cu and 10 at. % Al.

Adjustment of target surface to steady state

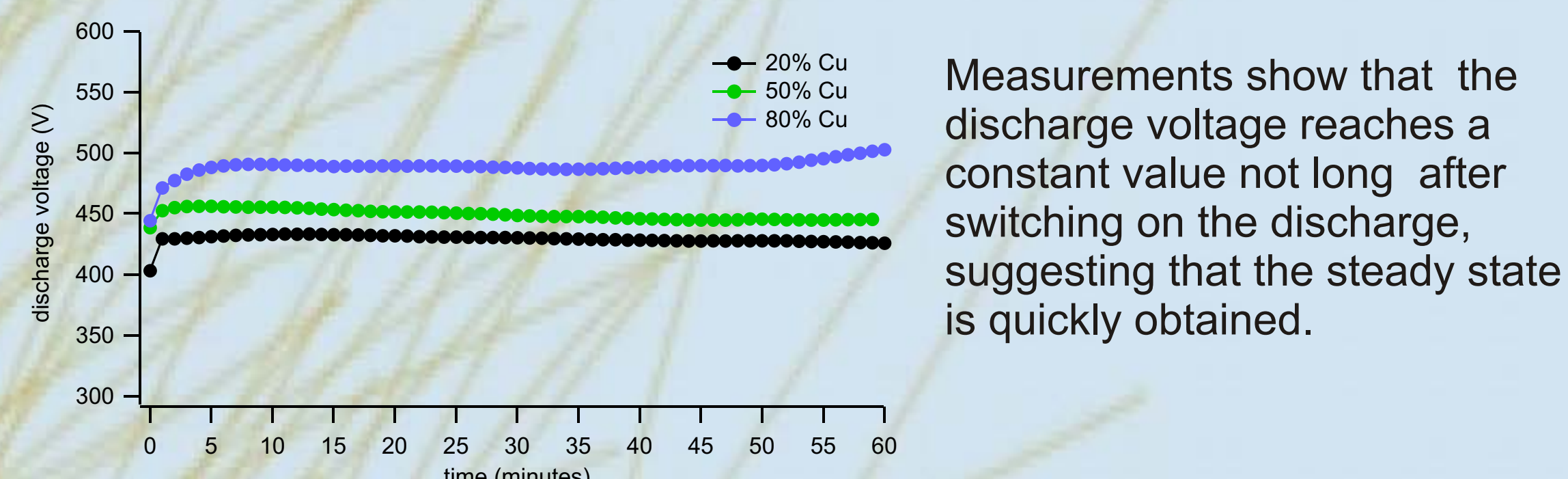
Thin films were deposited in metallic and poisoned mode. Their composition was measured using EDX. The target and thin film composition are equal within the error. This result is understandable from a modified target surface composition due to the sputtering process.



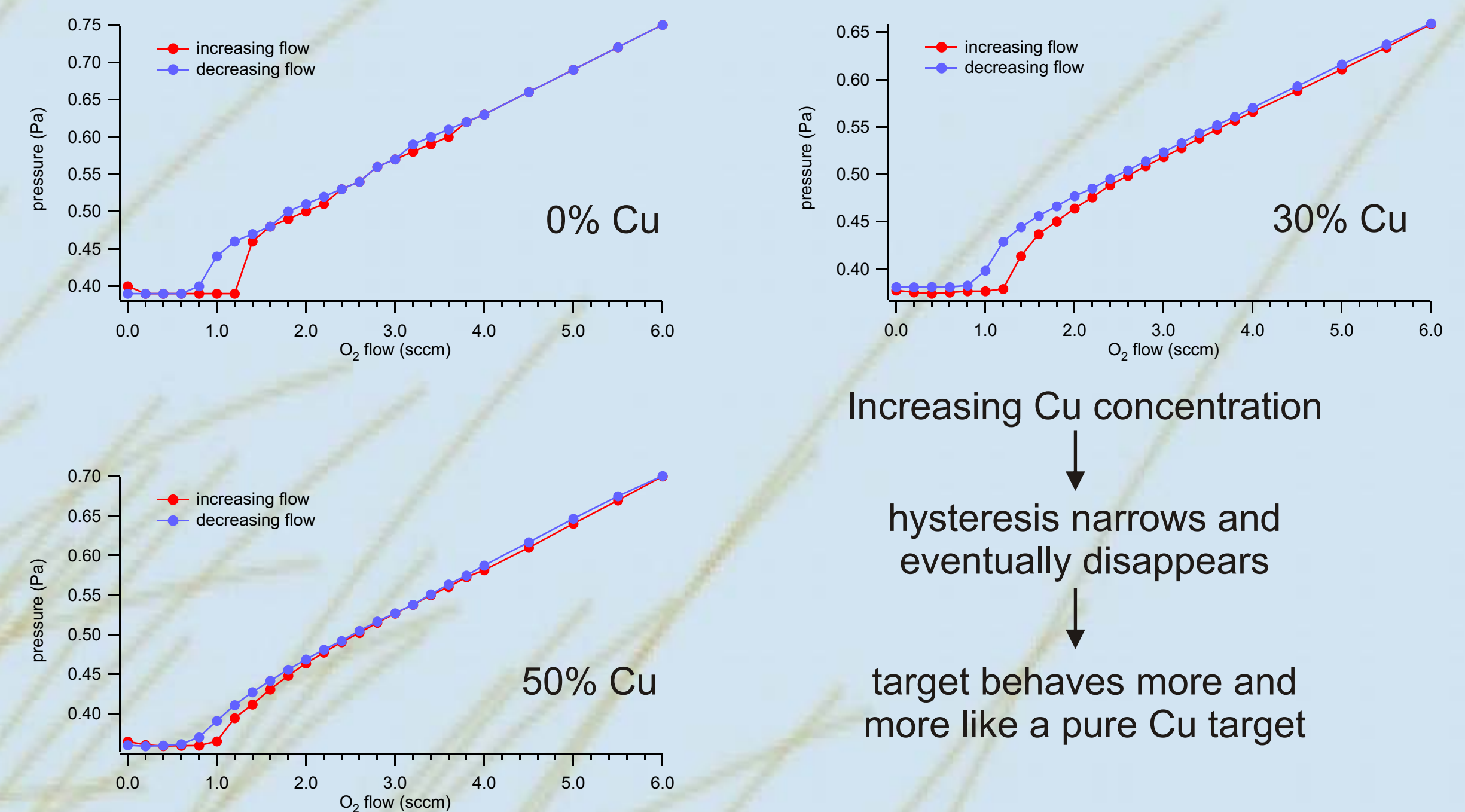
The sputter yields of Cu and Al could be calculated from the measured discharge currents and the mass difference before and after sputtering of a pure Cu and a pure Al target. For Al, a yield was found of 0.70 which is comparable to 0.71 for a regular Al target, while the yield of Cu was reduced from 1.89 to 1.17.

Due to the difference in sputter yields of the two species, the target surface will initially adjust itself until a steady state is reached.

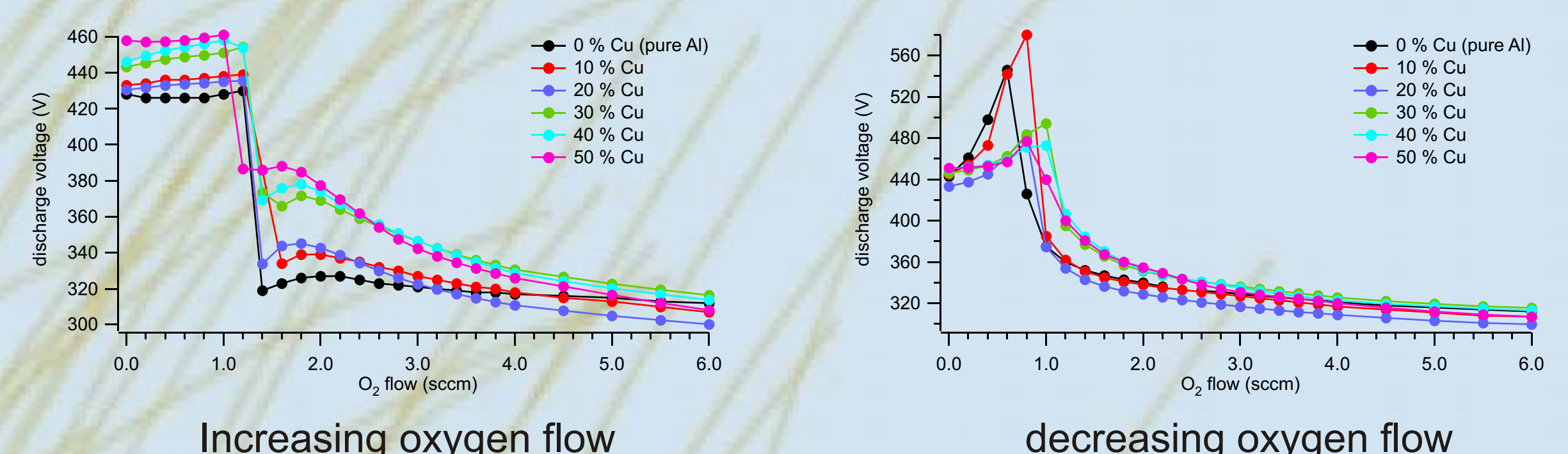
The time it takes to reach the steady state depends on the sputter yields, the current density, the grain size, the density of the material and the target composition.



Hysteresis measurements: pressure



Hysteresis measurements: discharge voltage



- Higher initial discharge voltage as Cu concentration increases.
- Critical point remains unchanged until 50% Cu.
- Depth of voltage drop depends on Cu concentration.

- No significant difference between targets in poisoned region: all surfaces consist mainly of oxidized Al.
- Discharge voltage returns to original value when going back to metallic mode.

Powder targets prove to be a reliable and easy alternative for fast scanning a wide range of different compositions when depositing thin films containing multiple metallic components. While hysteresis measurements suggest that the powder targets behave similarly to regular ones, this should be further examined.

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