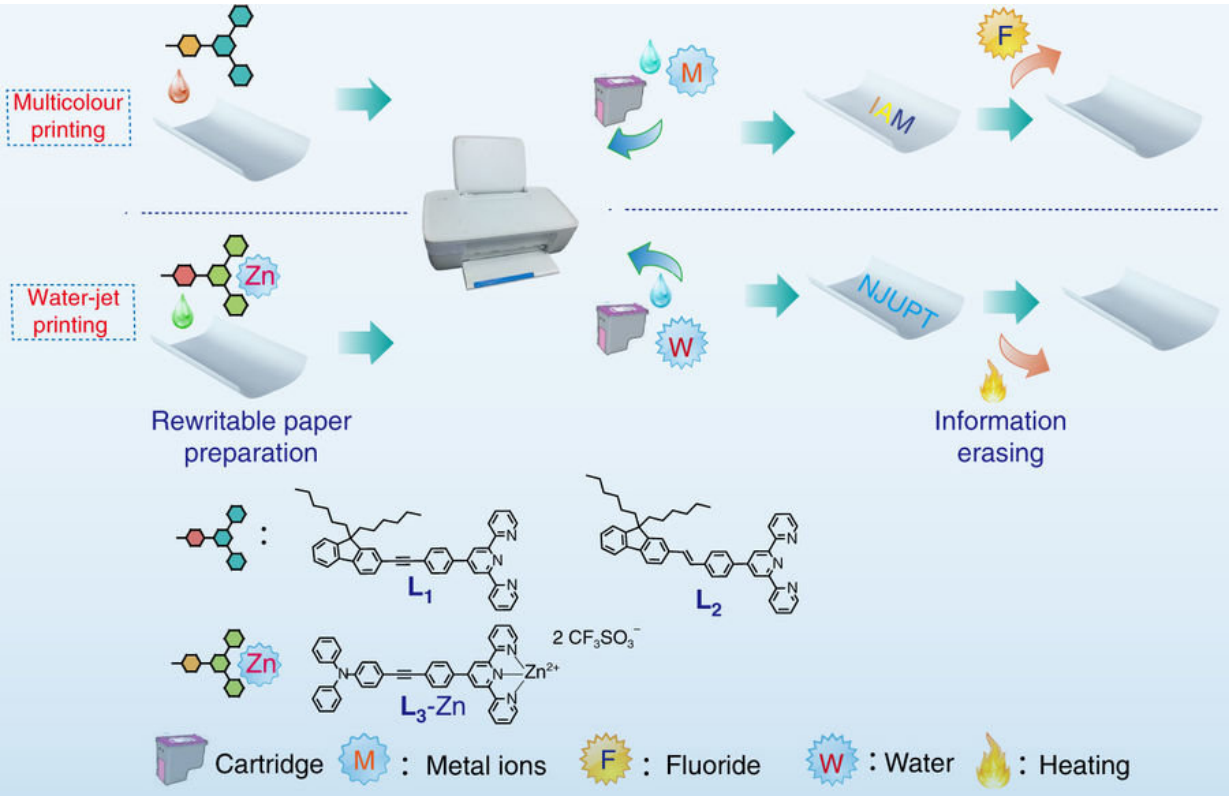
Special paper can be erased and printed on multiple times

January 10 2018, by Bob Yirka



Schematic illustration of multicolour and water printing. Chemical structures of L 1 , L 2 and L 3 , and the printing and erasing processes for the constructed rewritable paper. Credit: *Nature Communications* (2017). DOI: 10.1038/s41467-017-02452-w

A team of researchers with Nanjing University of Posts and

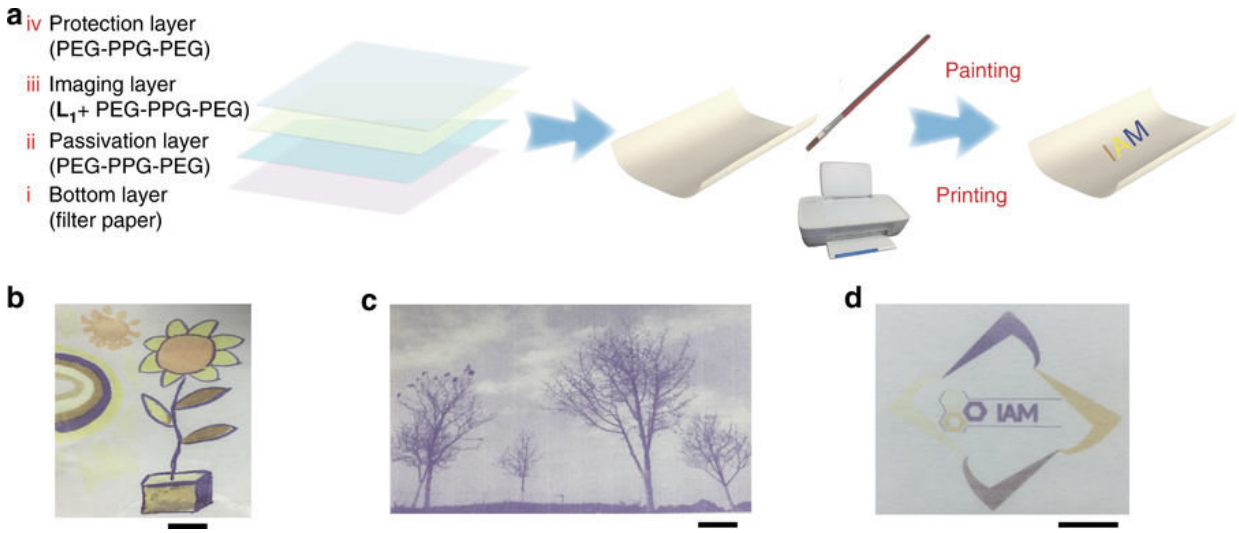
Telecommunications, Nanjing Tech University and Northwestern Polytechnical University, all in China, has developed a new type of paper that can be erased and printed on multiple times. In their paper published in the journal *Nature Communications*, the group explains how they made their paper, how well it works and the ways they are looking to improve it.

Paper that could be erased and reused would contribute to protecting the planet—paper production produces pollutants, and the search for new sources of wood for paper production has led to deforestation around the world. While the paper developed in China will not likely change that, it does suggest that chemists might be getting closer to a replacement product.

The new paper is actually a combination of special paper and ink. The paper is a multilayer mat of polymers imbued with chemicals that react with metal salts to produce seven distinct colors. The chemicals in the paper are terpyridine molecule ligands that correspond to specific metal ions such as zinc, iron or cobalt. The team also added fluorene to improve the optical properties of the paper. To print onto the paper, the researchers used a standard inkjet printer—its ink was made by mixing the metal salts with an aqueous solution. The researchers report that they were able to erase and reprint the paper eight times before it started to lose its intensity and that the ink remained vibrant on the page for up to six months. They also claim that taking into account the number of times a single page can be used, the cost of printing with their paper would be just one-fifth the cost of printing with a traditional inkjet printer.

The group also created a second type of erasable paper that used only regular water as its ink. The paper was made with a multi-layered zinc-ligand complex that reflects orange light when exposed to water. That paper was only able to display one color and it was lighter than with the first method, but the team suggests the proof of concept might be

broadened, leading to an even greener way to produce paper.



Structure and multicolour printing of rewritable paper. a Schematic illustrations of four-layer structure used to create the rewritable paper based on L 1 . b Colourful image of a flower drawn by different metal salts aqueous solution as ink. Scale bar = 1 cm. c An image of trees printed using a customized black inkjet cartridge filled with FeCl2 aqueous solution. Scale bar = 1 cm. d Colourful printing of the badge of Institute of Advanced Materials using an inkjet cartridge filled with FeCl2, Zn(NO3)2 and Co(NO3)2, respectively. Scale bar = 1 cm. Credit: *Nature Communications* (2017). DOI: 10.1038/s41467-017-02452-w

More information: Yun Ma et al. Dynamic metal-ligand coordination for multicolour and water-jet rewritable paper, *Nature Communications* (2017). DOI: 10.1038/s41467-017-02452-w

Abstract

Rewritable paper has recently become prevalent in both academic

research and marketplace due to the potential environmental advantages, including forest conservation, pollution reduction, energy saving and resource sustainability. However, its real-life applications are limited by a lack of effective strategy to realize multicolour and water-jet printing on rewritable paper with long legible image-lasting times. Herein, we report an effective strategy to construct rewritable paper based on colour or luminescence switching induced by dynamic metal–ligand coordination. This type of rewritable paper can be conveniently utilized for multicolour water-jet printing by using aqueous solutions containing different metal salts as ink. In addition, the printed images on the water-jet rewritable paper can be retained for a long time (> 6 months), which shows great progress compared to previous work. We believe that this type of rewritable paper could be considered as a prototype for multicolour water-jet printing to meet the practical needs.