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Nowadays, many researches are being conducted on the reuse of printed paper due to environmental pollution caused by waste paper. In general, most of the chemicals used in de-inking include products such as peroxide, caustic soda, and surfactant, which act on fiber inflation, ink removal, moistening, dispersion, and cohesiveness. However, using these chemicals can reduce the quality of recycled paper and cause secondary environmental pollution. Therefore, in this study, instead of using aforementioned chemicals, the atmospheric plasma treatment was used to assist the deinking of printed paper. Plasma treatment showed promising results for an efficient ink removal. To understand the effect of plasma on printed paper deinking mechanism, we studied the surface wettability, morphology and composition. UV-VIS spectroscopy showed the efficiency of deinking via reflectance measurement, SEM was carried out to observe the surface of printed paper after plasma treatment, surface wettability was estimated by water contact angle measurement and the change of compositions was investigated through FT-IR and XPS. As a result, the efficiency of deinking is assessed, thanks to the low temperature of plasma paper quality is retained. The plasma treatment can clearly speed up the process of deinking and avoid the use of harmful chemicals, making this method a promising pathway for eco-friendly ink removal.