Use of Sustainable Auto-Catalytic Metallization in the Fabrication of Planer Inductors

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The development of sustainable technologies that are shown to reduce waste, optimize the use of resources, emit less pollutant, and provide increasingly more energy efficient options is a priority to society as we become more environmentally aware. Moreover, the importance of these factors are increasingly impressed on manufacturers in an effort to remain profitable.

The fabrication of onboard passive components is very popular in electrical and electronics manufacturing technologies. Methods of printed circuit board manufacturing, used for making passive onboard devices such as inductors, have been unchanged for decades. Current PCB technology uses subtractive processes which involve acids and solvents which produce significant toxic waste in creating the metallic layers. In this paper, we focus on the fabrication of the planer inductor in demonstrating the use of this process in auto-catalytic process as a feasible alternative to subtractive technologies.

In this process, the copper is directly plated onto the substrate in the pattern to be used by imaging a catalyst for the chemical deposition of metal onto the surface of the substrate. The first part of this process includes preparing the surface of FR-4 with a layer of silicon dioxide to increase the hydrophilic properties of the FR-4. The catalyst is then imaged and the specimen is processed for copper deposition. This method has been shown to reduce metal wastes and eliminate the use of solvents and acids.

Inductor designs were fabricated and measured using this technology. Similar inductors were made by high-resolution inkjet printers using silver nanoparticles. Comparison of these two methods showed lower resistivity of conductors and significant improvement in the quality of inductors fabricated using autocatalytic method. This new method is additive and eliminates the use of hazardous chemicals such as acids and solvents during the fabrication process. It also reduces the number of fabricating steps and improves the fabrication speed.

Some of the figures and samples are shown below which will be included in the poster.

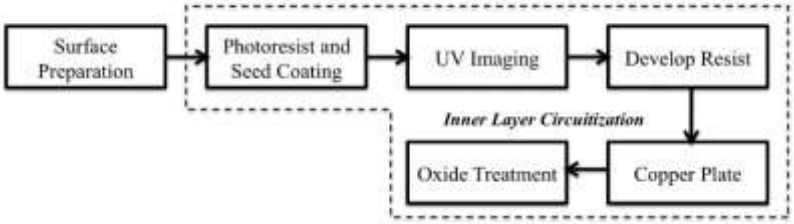

Figure 1 demonstrates the characteristics of the auto-catalytic fabrication process

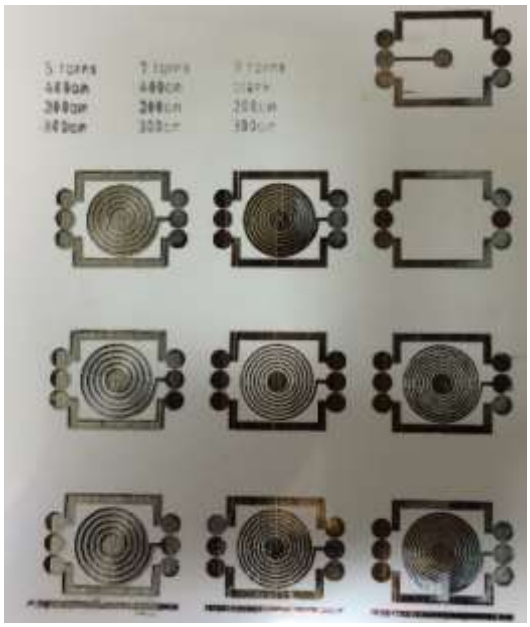

Figure 2 shows various inductors designed and printed using the Dimatix Inkjet printer with silver nano-particles.

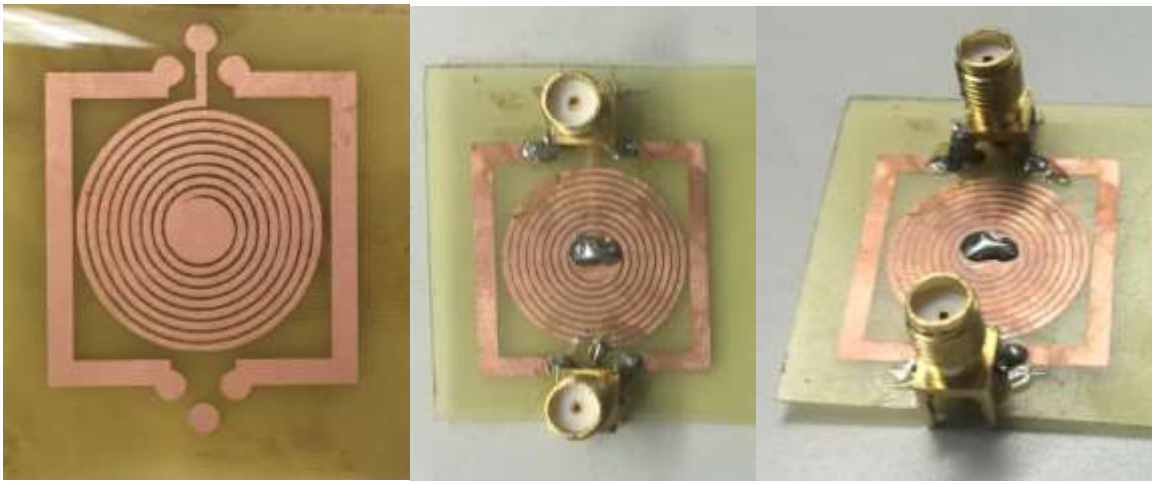

Figure 3 shows an inductor fabricated using auto-catalytic metallization. This inductor is 2 cm square in diameter with 9 turns and 300 micro-meter wide spiral coils. The first image on the left shows the inductor after immediate processing and the right shows the inductor with added cable connections for inductance analysis.