Nanostructured strain sensors for structural monitoring

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Recently, wireless strain sensors capable of exploiting structural colors have attracted interest in new emerging applications such as robotics or composite materials monitoring [1]. Many approaches for mechanically tuning color using photonic crystals and plasmonic nanostructures have been reported and are fabricated typically using two techniques: the first one is self-assembly [2] and the second one is soft lithography [3].

In this work we study alternatives to obtain an affordable fabrication process for the nanostructured strain sensors. Laser interference lithography is used to obtain the original master with periodicity of the nanostructure easily tunable between 200 nm and 800 nm. From this master, multiple nanostructured films are obtainted by thermal Nano-Imprint-Lithography on PVC. In order to maximize the optical response of those film a metallic layer is added by evaporation. These nanostructured labels are glued to metallic specimens and tested on a test bench (Fig 1). We have demonstrated experimentally that deformations down to 1% can be measured analizing the optical response of those labels (Fig 1).

This development is focused on its applications on structural health monitoring of H2 storage and aeronautic composite components

References

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Figures

Figure 1: Insert caption to place caption below figure (Calibri 11)