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## Hierarchical Sensing System Combining Optical Fiber Network and Distributed Built-in CVM Sensors: Delamination Monitoring of CFRP Structure

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This study develops a novel delamination monitoring system by extending our previous approach for monitoring surface-cracks in a large-scale composite structure. In the new system, numerous thin glass capillaries are stitched into a CFRP laminate, and internal pressure in the built-in capillary sensors, based on comparative vacuum monitoring (CVM), is maintained as a vacuum. When delamination is induced, the capillary sensors located within the delaminated area are breached, and air flows into the capillaries. The consequent pressure change within the capillary is then converted into axial strain in a surface-mounted optical fiber through a transducing mechanism, which is connected to the capillary. By monitoring the strain distribution along the optical fiber, it is possible to identify a transducing mechanism in which the pressure change occurred and thus to specify the location of the delamination. This study begins by establishing a sensor deploying/embedding method by replacing stitching yarns of dry carbon fabrics with capillary sensors. Finally, the hierarchical fiber-optic system is validated in a plate specimen.

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**Ключевые слова:**

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