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DEVELOPMENT OF CARBON FIBER ASSISTED UNIVERSAL JOINTS OF METALS AND DIFFERENT METAL OR POLYMERS (M/M, M/P)

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Summary: A new method with extremely large friction force by broad interface of carbon fiber (CF:6μm-diameter) have been suggested for a joint (M/CF/P and M/CF/M) of carbon fiber (CF) reinforced polymer (P) and metal (M). The new joint part was strengthened by impregnated carbon fiber (CF). The joint tensile strength (σb) and Charpy impact value (auc) of both M/CF/P and M/CF/M joints were tremendously times higher than that of the glue joint (M/Glue/P and M/Glue/M) and wrap-casting joint (M/P and M/M). The new joint method by using carbon fiber remarkably improved the σb and auc, resulting in the high fracture toughness with lightweight.
In order to improves the safety level, the new joint method with extremely large friction force by broad interface of carbon fiber (CF:6μm-diameter) coated by nickel (Ni) to prevent carbides formation and to enhance the ability of fiber rapping by molten metals have been suggested for joints (M/Ni-CF/P and M/Ni-CF/M) of carbon fiber (CF) reinforced polymer (P) and metal (M). The new joints part was strengthened by impregnated nickel-coated carbon fiber. The joint tensile strength (σb) and Charpy impact value (auc) of both M/Ni-CF/P and M/Ni-CF/M joints were tremendously times higher than that of the glue joint (M/Glue/P and M/Glue/M) and wrap-casting joint (M/P and M/M). In addition, Ni coating improves the decreased the experimental errors.
Based on the XRD analysis and EPMA observation, the carbides formation and carbon diffusion in fiber and matrix could not be detected by Ni-coating. Consequently, the new joint method by using carbon fiber coated with Ni remarkably enhanced the safety level with lightweight and high resistance to fracture toughness of airplane-parts.