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Inverse Problem to Determine an Epoxy Film Parameters in a Tri-Layer Metal/Adhesive/Metal Structure

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The aim of this work is to give the elastic parameters and the thickness of a slim epoxy film of a tri-layer metal/adhesive/metal structure, by inverse problem on the experimental data, knowing the characteristic equation of the structure. This equation is firstly solved and the sensitivity of some modes to the parameters of interest is studied. The couple of solutions wavenumber-frequency obtained from the direct problem are reintroduced in the characteristic equation, looking for the longitudinal and shear waves velocities, and the epoxy thickness that minimise this equation. A criterion that takes into account the averaged and the variance values of each parameter is deduced and allows these parameters determination in $\pm 3\%$ of the used values. To test the reliability of the method, the wavenumber solution is randomly perturbed in $\pm 5\%$ range, as the experimental wavenumber is expected to be weakly different from the theoretical one. The velocities and the thickness obtained still in the $\pm 3\%$ range around the used values. This method is then applied on experimental data obtained from a Duraluminum/epoxy/Duraluminum structure. The longitudinal and shear velocities and the thickness of the epoxy film obtained are in $\pm 3\%$ around the given values.