Acoustic scattering by inhomogeneous anisotropic obstacle: Boundary-domain integral equation approach

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We consider the time-harmonic acoustic wave scattering by a bounded layered *anisotropic inhomogeneity* embedded in an unbounded *anisotropic* homogeneous medium. The material parameters and the refractive index are assumed to be discontinuous across the interfaces between the inhomogeneous interior and homogeneous exterior regions. The corresponding mathematical problems are formulated as boundary-transmission problems for a second order elliptic partial differential equation of Helmholtz type with discontinuous variable coefficients. We show that the boundary-transmission problems with the help of *localized potentials* can be reformulated as a *localized boundary-domain integral equations* (LBDIE) systems and prove that the corresponding *localized boundary-domain integral operators* (LBDIO) are invertible.

First we establish the equivalence between the original boundary-transmission problems and the corresponding LBDIE systems which plays a crucial role in our analysis. Afterwards, we establish that the localized boundary domain integral operators obtained belong to the Boutet de Monvel algebra of pseudo-differential operators. And finally, applying the Vishik-Eskin theory based on the factorization method (the Wiener-Hopf method) we investigate Fredholm properties of the LBDIOs and prove their invertibility in appropriate function spaces. This invertibility property implies then existence and uniqueness results for the LBDIE systems and the corresponding original boundary-transmission problems.

Beside a pure mathematical interest these results can be applied in constructing and analysis of numerical methods for solution of the LBDIE systems and thus the scattering problems in inhomogeneous anisotropic media.

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