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A Two-Scale FEM formulation for Hetereogeneous Materials AXINTE IONITA, ERIC MAS, BRADFORD CLEMENTS, Los Alamos National Laboratory, Theoretical Division — We present a new Two-Scale Finite Element formulation, in the dynamic case, for the heterogeneous materials (for example, high explosives and other composites). The method employs two sets of finite element discretizations: one global (associated with the I^{st} scale) and, for each element in the mesh at the I^{st} scale, a local discretization (associated with the II^{nd} scale). Using the principle of virtual work in conjunction with the localization problem the Two-Scale FEM equations are established for two cases: the case when the representative volume element (RVE) is much smaller than the finite element size of the I^{st} scale, and for the case when the RVE size become comparable with the finite element of the I^{st} scale. The obtained equations are decoupled in the sense that the dynamics equations are solved relative to the I^{st} scale while the II^{nd} scale is used to determine the material response. The proposed approach allows more flexible and a better correlation with experiments and eventually can be incorporated in a larger context analysis involving heterogeneous materials. Numerical examples are included. LA-UR-06-5889.

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