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In this work we modify the Algebraic Multiscale Solver for unstructured to enable the simulation of multi-phase flow in heterogenous fractured porous media. We employ a formulation in which the fracture network is represented in dimensional space lower than the fine-scale discretization . the matrix and independent multiscale coarse grids are constructed for the matrix and fracture domains with the help of an auxiliary mesh. This means that these grids can be used to properly represent the complex geometry of the physical domain. Thus, the method calculates base functions that are capable of capturing the important aspects of the fluid flow inside the fractures. In order to produce a consistent solutions on unstructured and anisotropic grids, we coupled the AMS with a Multi-Point Flux Approximation with diamond stencil (MPFA-D). The performance of the method is evaluated in several test cases, which are compared with the solutions on the fine scale. Precise and efficient results are achieved in the flow simulation in highly heterogeneous and fractured reservoirs, using unstructured grids in both the fine and coarse scale.

**Keywords:** Algebraic multiscale methods, Flow in fractured porous media, Finite Volume Method, MPFA-D.