The Computations for Advanced Materials and Manufacturing Laboratory (CAMML) in the College of Engineering and Physical Science at the University of Wyoming has an immediate opening for a PhD research assistant available, in the general area of modeling of damage and failure in heterogeneous material subjected to multiphysics environment, with a starting date of Spring 2023.

At CAMML, our efforts focus on developing sophisticated multiscale/multiphysics methods in conjunction with data-driven methods for the modeling, design, and manufacturing of high-performance martials and advanced-manufacturing processes. The group has extensive experiences in modeling of deformation, failure, and state evolution in complex material systems and multiphysics processes. Past and current work includes crystal plasticity finite element modeling of plastic deformation and damage initiation and propagation in various advanced alloys used in aerospace, nuclear and automobile industries; multiscale reduced-order modeling of heterogeneous materials that efficiently bridges microscale and structural scale modeling; modeling and design of composites under volumetric and interfacial damage; multiphysics modeling of composite manducating process including 3D printing. The group currently has four Ph.D. students and three undergraduate students, with collaborators from other universities, national labs and research centers.

Relevant to the current position, we aim to study the hydraulic fracture of Mowery Shale, the largest hydrocarbon source for Lower Cretaceous petroleum systems in the Powder River Basin, Wyoming. However, Mowry Shale is geochemically and geomechanically complex, hence deep understanding of the reservoir is needed before economic and large-scale unconventional oil and gas production. This proposal aims to develop physics-informed multiphysics modeling to understand the interaction between key Mowry Shale geo-features (i.e., bentonite layers) and hydraulic fractures, to advance the geomechanical and geochemical understanding of the Mowry Shale relative to production and performance. To conduct the proposed research, the candidate is expected to be a highly self-motivated individual with interests and experience in computational modeling, numerical methods, finite element modeling, high-performance computing, and code development experience in C++, MATLAB, Python or other languages. The development is expected to be conducted in the Multiphysics Object-Oriented Simulation Environment (MOOSE), with close interaction with experimentalists. Prospective student with the interest and background in computational modeling is encouraged to contact Dr. Zhang by email: xiang.zhang@uwyo.edu, with email subject “hydraulic fracture”. Please note, due to time constraints, we may only be able to respond to selected candidates.