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THE ROLE OF THE SOLID PHASE IN TUMOR GROWTH MODELING

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Multiphase porous media mechanics is applied to model tumor growth [1, 2]. The multiphase system consists of four phases: the extracellular matrix (ECM), the tumor cells (TC), which may include a necrotic portion depending on the environmental conditions and pressure; the healthy cells (HC); and the interstitial fluid (IF) with the dissolved chemical species. The three phases, HC, TC and IF are modeled as fluids while the ECM is an elasto-visco-plastic solid. The governing equations are obtained by means of the Thermodynamically Constrained Averaging Theory (TCAT) involving two scales [3]: the microscopic scale (pore scale) and the macroscopic scale which is the scale of interest where the governing equations are solved numerically. The Finite Element Method is used for this purpose. The interaction between the constituents is investigated. Several cases of biological relevance are solved where inclusion of a solid phase, missing in most legacy growth models [4], is unavoidable.

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