Permeability and electrical conductivity of partially molten material

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Melt phase on grain boundary migrates as a form of permeable flow, which is controlled by permeability. The permeability depends greatly on the morphology of the liquid phase, which is controlled by the surface energy between solid and melt phase in the partially molten system. Understanding of the permeability in this complex morphology is needed to clarify met migration in the partially molten region in Earth. Using gel as an analog of a solid phase of the partially molten system, a mixture system of a solid and liquid phase is realized. Permeability obeys power-law function of the liquid fraction and an exponent of the power becomes larger with reduction of the liquid fraction under about 10%. Permeability is proportional to the square of the electrical conductivity.