With the increased availability of new geomagnetic data, mainly from the Swarm mission satellites, it is possible to obtain global mantle conductivity models. A subsequent task is to interpret such models in terms of the thermal and chemical structure of the Earth's mantle. It can be done using the experimental conductivity data for major mantle minerals combined with the Gibbs energy minimization. Here I describe these methods and present a forward problem calculating the electrical conductivity of the Earth's mantle, from its temperature and chemical composition. I also present the modelling results for a-priori temperature and compositional settings. This software component will become part of the existing tools used for global inversion of electromagnetic data to constrain the thermochemical and mineralogical structure of the mantle.