Pyrite (Iron disulfide) has been demonstrated to be very useful material for the development of electrodes used in lithium batteries. The abundance, non-toxicity, and high theoretical specific energy of the Li/FeS₂ couple (1273 Wh/kg based on 4e/FeS₂) make the natural mineral, pyrite, a promising cathode material for lithium batteries [1].

Experimental lithium secondary cells with pyrite electrodes have presented excellent reversible specific energy density at high temperatures (400–450°C) or specific capacity at moderate temperatures (625 mA·h/g at 135°C) [2]. However, lithium cells with pyrite electrodes tested at room-temperature have shown inadequate characteristics and poor cycling properties [3-5].

In this work, we have studied electrochemical properties of synthetic and natural pyrite composite electrodes at room temperature. FeS₂ composite electrodes (comprised of FeS₂, PVdF-HFP and carbon black) were characterized in a lithium cell at room temperature. The electrolyte used was LiN(CF₃SO₂)₂ in a solution of tetraglyme and 1,3-dioxolane (1 mol/L). The FeS₂ electrodes were characterized by SEM, XRD and electrochemical methods. For galvanostatic discharge/charge at a current rate of C/10 and between voltage limits of 2.6 and 1.1V, its discharge capacity up to 750mA·h/g at the first cycle and about 350mA·h/g at the 15th cycle are shown in Figure 1. The variation of interfacial resistances with storage time is also shown in Figure 2.

References