ABSTRACT

The use of polyurethane in the manufacture of nanoceramic polymer composites for thermal insulation because polyurethane has differences with other plastic materials, the synthesis process allows to control the desired end product properties and ZrO_2 is hard,strong and chemically inert which has a high melting point.In this final project, the authors study the effect of concentration and thickness effect on thermal insulation in producting a better thermal insulation material. The concentration of the materials used were polymer composites without ZrO_2 and with ZrO_2 of 0.5 and 0.7 gram and thickness of 1 and 1.5 cm, respectively. The thermal properties of polyurethane are characterized by thermal photos using thermal imaging. The morphology of the material uses a metalloghrapic tes using a smal scale streo microscope and a larger one using a scanning electron microscopy. The result, from the scanning electron microscopy test, showed that in polymer composites without ZrO_2 material, the surface morphogly was larger between one pore and the other. Then, the experimental result in manufacture of ZrO_2 nanoceramic polymer composites were analyzed using a graph method that describe the relationship between the transfer rate divided by surface area (Q/A) to changes in the temperature divided by material thickness ($\Delta T/L$) which the graph shows the initial PU conductivity value of 0.02 W/m.K resulted in thermal conductivity from the addition of 0.5 (gram) and 0.7 (gram) ZrO_2 at thickness of 1 cm and 1.5 cm, such 0.0211 W/m.K and 0.0165 W/m.K. Also, 0.0163 W/m.K and 0.0180 W/m.K.

Keywords: polyurethane, ZrO_2, SEM, thermal imaging, metallography.