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Differential scanning calorimetric studies of polyester fabrics used in sewing ring of an heart valve

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Abstract. Experimental values of heat of fusion for two indigenous polyester fabrics, candidate materials used in sewing ring of an heart valve, were 25.5 and 52.7 J/g while it was 65.3 J/g for an imported Dacron fabric The latter was selected as a reference material in view of its long clinical record. The implications of the observed differences in T_g, T_m and per cent crystallinity are discussed and some level III test areas indicated.

Keywords. Polyester fabrics; heart valve; differential scanning calorimetry.

1. Introduction

The characteristics required of a material in cardiovascular application vary markedly with the particular application. Moreover, even where the ultimate functional requirements of a material can be specified, the imperfect state of our understanding of blood-material interactions at present makes it highly questionable that these functional requirements can be translated into values of physicochemical properties of the material. The Working Group on Standards for Physicochemical Characterisation of Biomaterials formed by the National Heart, Lung and Blood Institute, for instance, concludes that the development of performance standards for the materials at the present time would be inappropriate (NIH Publication No. 80–2186, 1980). Instead, it recommends the development of a compendium of appropriate test methods themselves. Following these guidelines we wished to explore the suitability of differential scanning calorimetry (DSC) as a test method for some of the materials used in devices currently being fabricated at this Institute. We present here the results of application of DSC for two of our candidate materials which were considered for fabricating sewing ring of an heart valve. A Dacron Fabric procured from United States Catheter and Instrument Incorporation served as a reference material in view of its long clinical record as a safe and satisfactory biomaterial.

2. Experimental

Prior IR spectroscopic studies confirmed that all the samples used in the present studies were chemically identical. The IR spectra were similar and identical to that of