

Stress Analysis of the Ceramics Heads with Different Sizes under the Destruction Tests

Authors : V. Fuis, P. Janicek, T. Navrat

Abstract : The global solved problem is the calculation of the parameters of ceramic material from a set of destruction tests of ceramic heads of total hip joint endoprosthesis. The standard way of calculation of the material parameters consists in carrying out a set of 3 or 4 point bending tests of specimens cut out from parts of the ceramic material to be analysed. In case of ceramic heads, it is not possible to cut out specimens of required dimensions because the heads are too small (if the cut out specimens were smaller than the normalized ones, the material parameters derived from them would exhibit higher strength values than those which the given ceramic material really has). A special destruction device for heads destruction was designed and the solved local problem is the modification of this destructive device based on the analysis of tensile stress in the head for two different values of the depth of the conical hole in the head. The goal of device modification is a shift of the location with extreme value of 1 max from the region of head's hole bottom to its opening. This modification will increase the credibility of the obtained material properties of bio ceramics, which will be determined from a set of head destructions using the Weibull weakest link theory.

Keywords : ceramic heads, depth of the conical hole, destruction test, material parameters, principal stress, total hip joint endoprosthesis

Conference Title : ICAMME 2014 : International Conference on Applied Mechanics and Mechanical Engineering

Conference Location : Melbourne, Australia

Conference Dates : December 11-12, 2014