The aim of this study was to enrich, characterize and identify strict anaerobic extreme thermophilic hydrogen (H-2) producers from digested household solid wastes. A strict anaerobic extreme thermophilic H-2 producing bacterial culture was enriched from a lab-scale digester treating household wastes at 70 degrees C. The enriched mixed culture consisted of two rod-shaped bacterial members growing at an optimal temperature of 80 degrees C and an optimal pH 8.1. The culture was able to utilize glucose, galactose, mannose, xylose, arabinose, maltose, sucrose, pyruvate and glycerol as carbon sources. Growth on glucose produced acetate, H-2 and carbon dioxide. Maximal H-2 production rate on glucose was 1.1 mmol l(-1) h(-1) with a maximum H-2 yield of 1.9 mole H-2 per mole glucose. 16S ribosomal DNA clone library analyses showed that the culture members were phylogenetically affiliated to the genera Bacillus and Clostridium. Relative abundance of the culture members, assessed by fluorescence in situ hybridization, were 87 +/- 5% and 13 +/- 5% for Bacillus and Clostridium, respectively. An extreme thermophilic, strict anaerobic, mixed microbial culture with H-2-producing potential was enriched from digested household wastes. This study provided a culture with a potential to be applied in reactor systems for extreme thermophilic H-2 production from complex organic wastes.