生質能	Energy from Biomass
8.1 一般名詞	8.1 General Terms
8.1.1 生質 指來自生物體可做為能源的非化石有機物。有些國家將做為能源的生質再進一步劃分為： 初級生質，指一些生長快速的植物體，可直接，或經轉化後作為能源使用。 次級生質，指製造纖維，食品，或其他農產品剩餘的廢棄物，以及畜產品的副產物，這些物質常經過物理處理而非化學處理。包括林產和農產品廢棄物，水肥，及廢物等。這些物質可作為能源使用。 （註）上述初級與次級生質之區別是基於經濟因素，生態學中此二名辭亦有定義。	8.1.1 Biomass Organic, non-fossil material of biological origin constituting an exploitable energy resource. In some countries biomass is further subdivided when considered as an energy resource into: Primary biomass Rapidly growing plant material that may be used directly or after a conversion process, for the production of energy. Secondary biomass Biomass residues remaining after the production of fibre, food or other products of agriculture, or biomass by-products from animal husbandry or food preparation, that are modified physically rather than chemically. Examples include waste materials from agricultural and forestry industries, manure, sewage, etc., from which energy may be produced. Note The above distinction between primary and secondary biomass is based on economic factors; the terms are otherwise defined in ecological science.
8.1.2 生物轉化 生質經生物處理轉變為有用的各種型態能量的程序（如生質燃料）	8.1.2 Bioconversion The transformation of biomass by biological processes, interalia, into useful forms of energy, known as biofuels.
8.2 轉化程序	8.2 Conversion Processes
8.2.1 生物轉化程序	8.2.1 Bioconversion processes

8.2.1.1 醱酵 有機物經微生物或微生物酵素的代謝而由此可轉變成更簡單產物的一種程序。廣義上是指以人為控制的任何利用微生物製造有用的產品。通常生質醱酵後的最終產品為氣體、液體或固體。	8.2.1.1 Fermentation The metabolism of organic compounds by micro-organisms or their enzymes to produce products simpler than the starting materials and, by extension, any microbial action controlled by man to make useful products. The end products of biomass fermentation are generally gaseous, liquid and solid.
8.2.1.2 好氣（嗜氧）醱酵 在有氧氣的條件下進行的醱酵程序（參閱 8.2.1.1）。這種程序對於生質轉化為能源的作用助益不多。	8.2.1.2 Aerobic fermentation Fermentation processes (see 8.2.1.1) conducted in the presence of oxygen; such processes are of little interest for the conversion of biomass to energy.
8.2.1.3 嫌氣（厭氣，厭氧）醱酵 在無氧氣的條件下進行的醱酵程序。下列之厭氣醱酵在以生質製造有用的能源上，極為重要。酒精醱酵：藉著微生物的作用將葡萄糖或其他基質中的能量抽出，酒精為其最終產物；甲烷醱酵，通常稱之為厭氣消化，醱酵過程中先由某些微生物將基質消化成有機酸再由甲烷菌轉變成甲烷和二氧化 碳；厭氣醱酵的設備稱為消化槽，所產生的甲烷和二氧化碳即為生物氣體。	8.2.1.3 Anaerobic fermentation Fermentation processes (see 8.2.1.1) conducted in the absence of air. The following anaerobic fermentation processes are significant in obtaining useful forms of energy from biomass: alcoholic fermentation: fermentation processes whereby certain micro-organisms extract energy from glucose and other substrates, with alcohol as an end product; methane fermentation, generally termed anaerobic digestion: fermentation processes whereby organic acids produced by certain micro-organisms are converted by other micro-organisms to methane and carbon dioxide; the equipment for anaerobic digestion is termed a digester and the mixture of methane and carbon dioxide so produced is known as biogas.
8.2.1.4 嗜中溫菌 在常溫（$t^{o}\leq 35^{o}C$ 或 $308^{o}K$）下活躍的細菌：這種細菌是主要的次級生質轉化者。	8.2.1.4 Mesophilic bacteria Bacteria that are active at temperatures close to ambient temperature ($t^{o}\leq 35^{o}C$ or $308^{o}K$): they form the principal conversion agents for secondary biomass.

8.2.1.5 嗜熱菌 在高於常溫（tº≤50ºC 或 323ºK，或根據權威資料 tº≤68ºCº 或 341ºK）下活躍的細菌。這種菌用來分解存在於某些初級生質中的高分子聚合 物，特別是對木材。 （註）嗜熱菌也用來改善傳統上使用嗜中溫菌的程序並藉以降低成本。	8.2.1.5 Thermophilic bacteria Bacteria active at temperatures above ambient temperature (tº≤50ºC or 323ºK or, according to some authorities, tº≤68ºC or 341ºK). They are used for breaking down highly polymerized compounds (e.g. ligneous substances) present in certain kinds of primary biomass, particularly wood. Note Thermophilic bacteria are also used in order to improve the performance and reduce the costs of processes traditionally carried out by mesophilic bacteria.
8.2.2 燃燒與氣化	8.2.2 Combustion and gasification
8.2.2.1 燃燒 一種直接產生熱量的放熱化學反應。	8.2.2.1 Combustion An exothermic chemical reaction intended for the direct production of heat.
8.2.2.2 熱解 在無氧的情況下，以高溫（tº≥200ºC）將生質熱分解，其產物通常是酸類，醇類，醛類，以及酚類的液態混合物，這些成份需用適當的方法分離。固態殘留物主要是木炭，可做為煉鋼焦炭的替代物。氣態產物則為含有一氧化碳，氫氣，甲烷及其他氣體的中熱值~15MJ/^{3}混合氣體。	8.2.2.2 Pyrolysis The thermal decomposition of biomass at high temperature (tº≥200ºC) in the absence of oxygen. The products are in general complex liquid mixtures of acids, alcohols, aldehydes and phenols which to be marketable require to be separated by the appropriate processes. The solid residue comprises primary char, that may be used as a substitute for coke in iron-making. The gaseous products, a mixture of medium calorific value, ~15 MJ/m^3,contain carbon monoxide, hydrogen, methane and other gases.

8.2.2.3 空氣氣化；氧氣氣化 空氣氣化是生質在高溫（≥800ºC）下轉化成低熱值氣體（2~5mj/m^3）的一種放熱程序，所需熱量由部份生質在空氣中燃燒供應；氧氣氣化與空氣氣化相似，只是以純氧代替空氣做為氧化劑。產品是低到中級熱值的氣體（5~20MJ/m^3）。 （註）這兩種程序所產生的氣體成份可利用加以修飾，即在反應器中通入蒸汽，使氫氣和一氧化碳經催化作用合成替代天然氣，或液態燃料，或化學藥品。	8.2.2.3 Air gasification; oxygen gasification Air gasification is an exothermic process whereby biomass is converted at high temperatures (≥800ºC) into a low calorific value gas (2-5MJ/m^3), by burning part of the biomass in air to supply the heat for the reaction; Oxygen gasification is similar to air gasification but, instead of air, oxygen free of significant contamination by inert gases is the oxidant, The product is a gas of low to medium calorific value (5-20 MJ/m^3). Note The composition of the gas produced by both processes may be modified by blowing steam into the reactor and the hydrogen and carbon monoxide produced by the processes may be synthesized catalytically to yield substitute natural gas, synthetic liquid fuels and marketable chemicals.
8.2.3 生物轉化之物理程序 某些物理程序應用到生物轉化技術中—為便於轉化的過程（例如減少水份含量，高水份含量是生質的性質，可用機器操作脫水，加壓脫水，過濾等方法。）或為便於產品的回收（例如於都市廢棄物掩埋場鑽孔到低層以回收厭氣消化所產生的甲烷，此外尚有蒸餾，傾倒，及其他分離程序）。	8.2.3 Physical processes in bioconversion technology Certain physical processes are employed in bioconversion technology-to facilitate conversion processes (e.g. reducing the high initial water content, characteristic of most biomass, by mechanical dewatering, pressure dewatering, filtering, etc.) or –to recover the products (by drilling into the lower layers of urban refuse dumps in which methane is formed by in situ anaerobic digestion, also distilling, decanting or using other separation processes).

8.3 生質的利用及其產品	8.3 Exploitation and products of biomass
8.3.1 燃料農場；合成燃料農場 種植生長快速植物的農場，可供應製造生物燃料所需的原料。這種農場可做如下歸類，每種農場選擇適當的品種是依據生長速率，收穫難易，及供 應上的經濟性等因素決定。燃料農場 可能是栽種樹薯，甘蔗，大戟屬植物等作物的農業形態，或是種植油加利樹快速生長樹木的林業形態，以做為燃料的來源。海洋燃料農場 是一種在海上的農場，利用生長極為快速具有潛力的巨型藻類，在適當的條件下，生長速率是陸生植物的幾倍，將可做為燃料的來源；巨型海帶即顯示有此潛力。淡水燃料農場 這是一種種植具有快速生長潛力的淡水植物農場，例如布袋蓮，可做為燃料的來源。 （註）燃料作物一詞是指生長迅速並種植在燃料農場，可做為燃料來源的植物種類。	8.3.1 Fuel plantation; fuel farm; Synthetic fuel (synfuel) farm A plantation or farm of rapidly growing plants providing a supply of raw materials for the production of biofuels. Such plantations or farms may be classified as indicated below. In each case the choice of suitable species is determined by such factors as growth rate, ease of harvesting, economics of supply, etc. Fuel plantations; fuel farms (on land) These may either take the form of agriculture in which manioc, sugar cane, euphorbia, etc., are cultivated as basic products, or of forestry in which rapidly developing trees, such as Pinus radiata or eucalyptus are grown, to serve as a source of fuel supply. Marine fuel farms These are offshore farms that exploit the exceptionally high growth-rate potential of certain giant algae, which, under suitable climatic conditions, may be several times that of the most rapidly growing land plants, to serve as a source of fuel supply; Macrocystis pyrifera (Californian brown kelp) has demonstrated this potential. Fresh water fuel farms These are farms based on the cultivation of fresh-water plants that have a rapid growth-rate potential, e.g. water hyacinth, to serve as a source of fuel supply. Note the term fuel crop is employed to describe species of plant chosen for their rapid growth and cultivated on fuel plantations or farms to serve as a source of fuel supply.

8.3.2 生質物氣體 由生質厭氣消化產生主要含有甲烷和一氧化碳的混合氣體，由這種混合氣體分離的甲烷稱為生物甲烷。	8.3.2 Biogas A gas composed principally of a mixture of methane and carbon dioxide produced by anaerobic digestion of biomass; the methane separated out of this mixture is termed biomethane.
8.3.3 乙醇；乙基醇（酒精） 由葡萄糖醱酵產生的一種醇。葡萄糖來自含糖植物，例如甘蔗，甜菜，或澱粉質纖維質原料之水解。酒精可以蒸餾法濃縮。 （註）酒精可與汽油摻配成汽醇，這是一種具經濟效益的汽車燃料。	8.3.3 Ethanol; ethyl alcohol Alcohol produced by the fermentation of glucose. The glucose may be derived from sugar-bearing plants such as sugar cane and beet or from starchy and cellulosic materials by hydrolysis. The ethanol may be concentrated by distillation. Note Ethanol may be blended with petroleum products to produce an economically marketable motor fuel, known as gasohol.
8.3.4 甲醇；甲基醇 主要是由化學合成的一種醇，但也可由木材乾餾中獲得。 （註）甲醇被認為是一種具有經濟效益的合成汽車燃料。	8.3.4 Methanol; methyl alcohol Alcohol primarily produced by chemical synthesis but also by the destructive distillation of wood, etc. Note Methanol is regarded as being a marketable synthetic motor fuel.
8.3.5 木炭 木材乾餾熱解的殘留固體。	8.3.5 Charcoal The solid residue of the destructive distillation and pyrolysis of wood.