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The role of bioenergy when considering the transition to a low-carbon economy

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The increase in energy demand worldwide has been a source of concern. Security of energy supply is a matter of governmental concern along with the environmental impact, namely with regard to climate change. This justifies policy implementation towards decarbonization. However, such a transformation to a low carbon-economy requires a change in the whole system. The shift to renewable resources has to ensure system's sustainability where resource supply, use and distribution need to be planned in an integrated efficient manner. Bio-resources provide flexibility, given the possibility of generating energy and biofuels/bioproducts in the same manner as a petroleum-based feedstock, with the addition to providing food-chain goods. Hence, bioenergy could play a central role but needs to be controlled in an integrated manner to guarantee that the system is sustainable. Forest, agriculture and waste efficient management involve various governmental bodies and stakeholders, which leads to the need to a strong coordination procedure. Governments need to identify the potential in terms of endogenous resources and to foresee the needs to have external supply sources as well as the potential to export derived fuels, products and final energy in the context of the European free market. The complexity can be high, given the diversity related to countries' particular conditions and because other non-biomass energy technologies are also evolving rapidly, as well as user demand characteristics. This calls for case studies, energy systems' modelling and evaluation as a basis for decision taking. In addition, accelerating application of new concepts and technologies developed needs to be ensured to demonstrate their feasibility whilst continuing efforts to reduce technological costs. As direct State Aid is becoming more difficult to justify, official certification schemes, regulatory measures and R&D support can be useful as policy options. Models should include both objective parameters as subjective ones to obtain an "optimum path".

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Coarse particle deposit formation in biomass combustion

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In the present work, the coarse deposit formation on cooled surfaces in biomass-fired boilers has been studied under different experimental conditions, with the focus on the high temperatures in combustion systems. Different deposition tests with real biomasses were conducted to characterize the slagging behavior for a range of conditions representative of those prevailing inside biomass boilers. A cylindrical head probe was used to study the formation of alkali salt deposits. The probe is composed of a cooled (by water or air) head and an exchangeable coupon mounted on it. A number of operational parameters, such as gas temperature around the probe or surface temperature in the bulk gases were changed in order to analyze their influence on the characteristics (morphology, thickness, composition…) of the ash deposits. Coarse particles are mainly originated from char and mineral fragmentation. Coarse particle deposits are mainly formed by transport of the coarse particles via inertial impaction to the upstream part of the tube, with the highest impaction rates at the forward stagnation point, decreasing rather rapidly with angular position along the surface. At angular displacements larger than about 50° (as measured from the forward stagnation point), the rate of inertial impaction drops to essentially zero under conditions typical of combustor operation. On one hand, biomass ashes have been analyzed using ASTM procedures. On the other hand, the deposit structure and composition was investigated by Scanning Electron Microscopy, equipped with Energy Dispersive X-ray Diffraction (SEM/XEDS). The results obtained are useful both to characterize the experimental method and to determine the influence of some parameters relevant to deposition phenomena. In particular, these data will be used for comparison with different predictive methods, including mechanistic models and the empirical correlations traditionally used in this field.

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