Photovoltaic Concentrator Applications Experiments 462
photovoltaic concentrators *see* concentrators
photovoltaic conversion, efficiency of 113–51
photovoltaic converters 59, 120–31
photovoltaic-diesel-hybrid system 768
photovoltaic efficiency 701
  annual 717
photovoltaic electricity 39
  contribution of 40–1
  technical potential 54
Photovoltaic Energy Project (PEP) 727
photovoltaic engineering problems 925
photovoltaic generator behavior under real operation conditions 947–56
photovoltaic industry 153
photovoltaic integrated as roofing louvres, façades and shading 1011–14
photovoltaic module cell temperature 955
photovoltaic module orientations 925
photovoltaic module placement and shadowing 1039
photovoltaic modules 5, 7, 34, 46, 60
  BIPV 1029–35
  certification 745–6
  energy collection and delivery 905–70
  *I–V* curve 867
  integration in architecture 1019–21
  measurement and characterization 701–52
  net energy loss 10–11
  qualification 745–6
  rating 947
  solar radiation available for fixed flat-plate conventional 947
  transparent 1009
  world production 22
photovoltaic performance, annual 718
photovoltaic performance rating 701–20
photovoltaic rating criterion 716
photovoltaics 753–98, 972
  advantages and disadvantages 3
  and all of the world's needs 7
  and development 1043–71
  areas of application 45, 754
  as empowering technology 1–2
  as environmentally clean and green technology 9
  as long-term substitute for electricity generation 48–54
  as small-scale cottage industry 7
  basic R&D 19
  components 784–94
  consumer applications 756–7
  development dimension 54–7
  economic assessment 980–4
  experience curve for 1976 to 1998 17
  funding 8–9
  future developments 794–6
  future of emerging technologies 37–9
  future potential 40
  future prospects 999–1002
  history 11–15
  immediate and exclusive use 7
  land area requirement 6–7
  motivation for application and development 45–60
  myths of 5–11
  notable events in history of 12
  overview 753–4
  public funding for R&D 9
  public support 8
  rational decision to develop 972
  status 1
  trend in worldwide applications 8
  use of term 3–5
  Utility-Scale Applications (PVUSA) project 467, 715, 736
Photovoltaics/Market Transformation Initiative (PV/MTI) 1101
*pin* device, electronic structure 528–30
*pin* photodiodes 508–9
*pin* solar cell 109
  absorber layer design 533–4
  band diagram 110
  power output 533
planar cell structures 310
plant cost 34
plasma-deposited silicon thin film 527
plasma-enhanced chemical vapor deposition (PECVD) 28, 243, 258, 284–5,314, 324, 341, 353, 520–1
*pn* junction 5, 24–5, 29
  *n*-type 30
  *p*-type 30
*PN*-junction diode electrostatics 83–7
point-contact cell design 469
point defects 184
point-focus Fresnel modules and systems 462
point-focus optics 456
Poisson's equation 81, 83
polar tracking 946
polycrystalline silicon 21, 26, 310
polycrystalline silicon wafers 1032–3
polymethyl methacrylate (PMMA) 453, 495
polysilicon 24, 161
  historical processes to manufacture 199
  rejects 178–9
  research projects 199
  *see also* semiconductor grade silicon