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Plasmas and Nanostructures for Energy Applications

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The contribution presents a Plasma Engineer's perspective on the utilization of plasmas and nanostructures produced through plasma processes in the context of energy, keeping in mind potential environmental impacts and process and product sustainability. Already-identified opportunities for plasma source and process development for end-of-pipe treatments are presented, but also for sustainability-inspired processes. In the area of nanomaterial synthesis, how can dry plasma processes making using a simple and environmentally-benign raw materials can be used to replace wet chemistry processes? How can one dictate power supply design for fine-tuned electrical energy utilization and minimal material use? How can plasma sources be used for off-hours electrical-to-chemical energy transformation and chemical energy densification? How can plasma sources be used for resource recovery from urban mines, e-waste and municipal solid waste so as to avoid energy-intensive primary mining, transformation, transportation and disposal of valuable and/or toxic materials? How can plasma-based processes be intensified for waste energy recovery and zero material losses? How can products be fabricated with minimal materials and energy use? How can products that are designed for recycling be fabricated and *de*-fabricated using plasma processes, at minimal energy cost? Some of the emerging works along the above-mentioned lines and conducted by Canadian research institutions are presented.