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(57) Abstract :

The invention discloses NanoDome-AI, a smart geodesic dome system for post-harvest crop preservation that integrates nanotechnology, artificial intelligence (AI), Internet-of-Things (IoT), and renewable energy autonomy. The dome structure is modular and coated with nanostructured materials imparting hydrophobic, antimicrobial, and insect-repellent properties to reduce crop deterioration. An IoT-enabled sensor network continuously monitors environmental parameters including temperature, humidity, volatile organic compounds (VOCs), and pest activity. Data are processed by an AI-based adaptive control module, which predicts environmental fluctuations and autonomously regulates ventilation, humidity control, antimicrobial lighting, and pest deterrent systems. The invention further incorporates a solar-based renewable energy subsystem for sustainable, off-grid operation in rural contexts. By combining multifunctional nanocoatings, intelligent adaptive regulation, and energy autonomy within a geodesic dome design, NanoDome-AI significantly minimizes post-harvest losses, enhances crop quality and nutritional stability, and provides a scalable, sustainable platform for food security and agricultural resilience.

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