



## SOLAR POWER BANK WITH WIRELESS CHARGING

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### Abstract

The use of solar power banks with wireless charging has become increasingly popular in recent years as a convenient and eco-friendly solution for charging mobile devices. However, these devices have limitations such as dependence on sunlight, slower charging speeds, limited charging capacity, and inconsistent charging in indoor or shaded environments. This literature review of research conducted between 2017 to 2022 shows that while users generally have positive attitudes towards these devices, further research is needed to improve their performance and usability. Factors such as sunlight intensity, temperature, and device compatibility can affect their efficiency and charging speed. Understanding these advantages and limitations can help users make informed decisions about whether a solar power bank with wireless charging aligns with their charging needs and priorities.

**Keyword :** Solar Power Bank , Instrument , Wireless Charging

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### Introduction:

In recent years, the demand for portable charging solutions has surged, driven by the need for uninterrupted connectivity and sustainable energy sources. One such innovative device, the solar power bank with wireless charging, has emerged as a practical and eco-friendly solution. By integrating solar panels and wireless charging technology, this portable device allows users to harness solar energy and charge their devices wirelessly, providing convenience and environmental benefits.

### Harnessing Solar Energy:

At the core of a solar power bank is its ability to capture sunlight and convert it into electrical energy. The device features

solar panels strategically placed on its surface, designed to absorb sunlight and generate power. These panels employ photovoltaic technology, utilizing semiconductor materials to convert solar energy into usable electricity. Through this process, the solar power bank accumulates energy and stores it in an internal rechargeable battery (Devi, K. G., Thakur, S. S., & Singh, S. K. ,2021).

### Wireless Charging Technology:

The solar power bank with wireless charging goes beyond traditional wired connections, introducing the convenience of wireless charging. It features a charging pad on its surface that uses electromagnetic induction to transfer

energy to compatible devices. With this technology, users can simply place their wireless-charging-enabled smartphones, smartwatches, or other devices on the charging pad, eliminating the need for cables and connectors.

### **Dual Charging Options:**

While wireless charging is a prominent feature of solar power banks, they also offer additional charging options. Alongside the wireless charging pad, these devices usually include USB ports or other conventional charging ports. These ports enable users to connect their devices directly using charging cables, serving as an alternative charging method when sunlight is insufficient or for devices that lack wireless charging capability (Patil, R. N., & Bhambulkar, A. V., 2020).

### **Benefits and Considerations:**

The solar power bank with wireless charging offers numerous advantages. Firstly, it harnesses clean and renewable solar energy, reducing dependency on traditional power sources and minimizing environmental impact. Additionally, it provides a portable and versatile charging solution, making it ideal for outdoor activities, travel, emergencies, and situations where a power outlet is unavailable. The wireless charging feature further enhances convenience, offering a cable-free charging experience.

However, it is important to note that the charging speed of solar power banks may be slower compared to traditional charging methods due to the reliance on sunlight. Therefore, users must plan accordingly and consider solar charging as a supplementary option rather than the primary means of charging. Additionally, factors such as battery capacity, solar panel efficiency, build quality, and user reviews should be taken into account when selecting a solar power bank to ensure optimal performance and reliability.

### **Limitations of Solar Power Banks with Wireless Charging:**

**Dependence on sunlight:** The primary limitation of solar power banks is their dependency on sunlight for charging. Solar panels require direct exposure to sunlight to generate electricity effectively. This means that the charging speed and efficiency of the power bank heavily rely on weather conditions and the availability of sunlight. In cloudy or low-light conditions, the charging process can be significantly slower or even ineffective.

**Limited charging capacity:** Solar power banks typically have smaller battery capacities compared to traditional power banks. This is due to the limited space available for solar panels and the need to maintain a compact and portable design. The smaller battery capacity may not provide sufficient power to fully charge multiple devices or larger devices such as tablets or laptops.

**Longer charging time:** Solar charging is generally slower compared to traditional charging methods. The charging speed of a solar power bank depends on factors such as the size and efficiency of the solar panels, the intensity of sunlight, and the battery capacity. It may take several hours or even days to fully charge the power bank via solar energy alone.

**Inconsistent charging in indoor or shaded environments:** Solar power banks rely on sunlight to generate electricity. Consequently, they are less effective or ineffective when used indoors or in shaded areas. Users may need to rely on alternative charging methods, such as plugging the power bank into a power outlet or using a conventional charging cable, when solar charging is not feasible.

**Durability and build quality:** Some solar power banks may have durability issues or subpar build quality, especially with regard to their solar panels. The panels can be susceptible to scratches, cracks, or damage from impact. It is important to choose a reputable brand and product with

good reviews to ensure the power bank's longevity and performance.

**Price and cost-effectiveness:** Solar power banks with wireless charging tend to be more expensive compared to traditional power banks. The inclusion of solar panels and wireless charging technology adds to the manufacturing costs, making them a pricier option. Users should consider whether the benefits of solar charging and wireless convenience justify the higher cost compared to conventional power banks.

### **Advantages of Solar Power Banks with Wireless Charging:**

**Eco-friendly:** Solar power banks utilize renewable solar energy as their power source, reducing reliance on non-renewable energy and minimizing carbon footprint. By harnessing sunlight, these devices contribute to a more sustainable and environmentally friendly charging solution.

**Portability:** Solar power banks are designed to be portable, making them ideal for outdoor activities, travel, and situations where a power outlet is unavailable. Their compact size and lightweight construction allow users to carry them conveniently in backpacks, purses, or pockets.

**Convenience of wireless charging:** The wireless charging feature eliminates the need for cables and connectors, offering a clutter-free and hassle-free charging experience. Users can simply place their wireless-charging-enabled devices on the charging pad, allowing for easy and convenient charging on the go.

**Versatility with multiple charging options:** In addition to wireless charging, solar power banks typically include USB ports or other conventional charging ports. This versatility allows users to charge their devices through traditional wired connections when sunlight is insufficient

or when wireless charging is not supported by their devices.

**Emergency power backup:** Solar power banks can serve as emergency power backup during power outages or in remote locations. With their ability to harness solar energy, they provide a reliable and independent source of power to keep essential devices charged and operational.

### **Disadvantages of Solar Power Banks with Wireless Charging:**

**Dependence on sunlight and charging speed:** The charging efficiency and speed of solar power banks heavily rely on sunlight availability. In cloudy or low-light conditions, the charging process can be slower or ineffective. Users need to consider the amount of sunlight available and plan charging accordingly.

**Limited charging capacity:** Due to the space constraints for solar panels and the need for portability, solar power banks often have smaller battery capacities compared to traditional power banks. This limitation may not provide sufficient power to fully charge multiple devices or larger devices with higher power requirements.

**Inconsistent charging in indoor or shaded environments:** Solar power banks require direct exposure to sunlight for efficient charging. Charging in indoor or shaded environments may not be as effective, necessitating alternative charging methods.

**Durability concerns:** Some solar power banks may have durability issues, particularly with their solar panels. The panels can be susceptible to scratches, cracks, or damage from impact. Users should choose reputable brands and products with good reviews to ensure long-lasting performance.

Higher cost: Solar power banks with wireless charging tend to be more expensive compared to traditional power banks. The inclusion of solar panels and wireless charging technology increases manufacturing costs, making them a pricier option.

### Literature review

In a study conducted by Parida et al. (2017), the researchers evaluated the feasibility of using solar power banks with wireless charging as an alternative source of power for mobile devices. The results showed that solar power banks with wireless charging can provide a convenient and eco-friendly solution for charging mobile devices.

Another study by Tan et al. (2018) investigated the efficiency of wireless charging in solar power banks. The researchers found that the charging efficiency of solar power banks with wireless charging is affected by factors such as sunlight intensity and the distance between the device and the charging pad. The study also concluded that the wireless charging feature provides convenience for users, but it comes at the cost of longer charging times.

In 2019, a study conducted by Shen et al. evaluated the impact of temperature on the charging efficiency of solar power banks with wireless charging. The results showed that high temperatures can reduce the charging efficiency of solar power banks, which can be a limitation for users in hot climates or during summer months.

A more recent study conducted by (Khobragade, Bhambulkar, & Chawda, 2022) evaluated the user acceptance of solar power banks with wireless charging. The researchers found that users generally have positive attitudes towards these devices due to their eco-friendliness and portability. However, users also expressed concerns about the charging speed and the

limitations of the solar panel in providing sufficient power for larger devices.

### Methodology

Here's how a solar power bank with wireless charging typically works:

**Solar panels:** The power bank is equipped with solar panels on its surface. These panels absorb sunlight and convert it into electrical energy, which is stored in the power bank's internal battery.

**Internal battery:** The power bank contains a rechargeable battery that stores the solar energy for later use. It is usually a lithium-ion battery, which offers a good balance between capacity and weight.

**USB ports:** Along with wireless charging, a solar power bank typically includes USB ports or other charging ports. These ports allow you to connect your devices directly using a charging cable, providing an alternative charging method when sunlight is not available or for devices that do not support wireless charging (Dr. Ashtashil Vrushketu Bhambulkar, et al., 2023).

**Wireless charging pad:** The power bank features a wireless charging pad on its surface. To charge a compatible device wirelessly, you simply place it on the pad. The power bank transfers energy wirelessly to the device, allowing it to charge without any cables.

**Charging status indicators:** Solar power banks usually have LED indicators that show the charging status of the power bank itself and any connected devices. This helps you keep track of the power bank's battery level and the charging progress of your devices.

### Conclusion:

The solar power bank with wireless charging combines the benefits of solar power generation and wireless charging

technology, providing users with an eco-friendly and convenient charging solution. By leveraging the power of the sun, this portable device allows individuals to charge their devices wirelessly while on the move. As sustainable energy becomes increasingly important in our daily lives, the solar power bank with wireless charging stands as an innovative and practical tool, enabling us to stay connected while reducing our carbon footprint.

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