

## 層状無機化合物を用いた自己修復材料 Self-healable Materials Utilizing Layered Inorganic Compounds

為末 真吾

### Abstract

Recently, self-healing materials have attracted much attention from various fields because they will be able to make materials around us usable in long lifetimes.

In this report, I introduce the self-healing hydrogel material we reported recently. The self-healing hydrogel we developed was formed by the intercalation property of layered inorganic compounds. Mica, layered double hydroxide, and other layered inorganic compounds can entrap cations, anions, and molecules between their interlayers. These properties were called “intercalation”. We used the intercalation property of mica to prepare self-healing materials. The synthesized polymer having cationic substituents as its side chains was mixed with mica in water. Afterward, the specimen formed hydrogel due to the cross-linking of the polymers via intercalation between layered inorganic compounds and the cationic polymer chains. The formed hydrogel showed self-healing property because the intercalation utilized for the cross-linker between polymers is reversible. Even if the hydrogel was cut into two pieces, the cut pieces formed into the original one hydrogel again by bringing into contact with each other. Self-healing materials introduced in this document and other various self-healing materials reported by other researchers will help us create materials having both high functionality and long life-span.

キーワード：自己修復材料、層状無機化合物、ソフトマテリアル、ゲル材料、インターカレーション  
**Keywords** : Gels, Intercalation, Layered inorganic compounds, Self-healing materials, Soft materials

### 1. 諸言

近年、傷を自動的に修復する自己修復材料(図1)に注目が集まっている。その理由として、材料が自然に傷を修復することで長期的な機能の保持や長期的な材料の使用が行えるよう

になることが期待されるからである。これまでに様々な自己修復材料が開発、報告されてきた<sup>1)</sup>。例えば、Whiteらは材料内部に樹脂原料を含んだカプセルを内包させることで傷が入った際に、カプセルが壊れ、樹脂原料が硬化することによって傷を塞ぐ手法を報告している<sup>2)</sup>。

---

2021年10月29日受付

TAMESUE Shingo

宇都宮大学大学院 地域創生科学研究科工農総合科学専攻 物質環境化学プログラム