

Creation of the keratin gel : an environmental response type smart material

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Human hair is mainly composed of cysteine-rich proteins such as keratin and keratin-associated proteins (KAPs). When a keratin solution was incubated with 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC), the zero-length cross linker between amino and carboxyl groups, the solution changed to opaque white/light beige color gel in appearance. The gel was formed according to the EDC and protein concentrations. Electrophoresis showed that the cross-linked proteins were free of KAPs and composed of keratin only. Thus, the gel was named “keratin gel”. The keratin gel could both retain various proteins and release some of them. Ovalbumin (MW=45 kDa; pI=5.2) incorporated into EDC/keratin gel was continuously released for 24 h. This time-release was suppressed when the incorporated gel was treated with oxidative treatment such as H₂O₂, while the release was slightly increased after reductive treatment of the gel. The keratin gels will be available for the controlled-release of macromolecules corresponding to oxidation-reduction environment.