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DO90-Zn²⁺ macrogel was suitable for encapsulating multiple types of bioactive substances, such as hydrophobic β -carotene, hydrophilic tea polyphenols and probiotics, exhibiting outstanding pH-responsiveness and resistance to gastric acid, bile salt and digestive enzymes *in vitro*. Right (A): Images of DO90-Zn²⁺ macrogel in their dry states and swelling states in SGF and SIF at different times. Right (B): The viable count of *Lactobacillus paracasei* after immersion in SGI for 5 h, as well as release files of β -carotene and tea polyphenols from sodium alginate, DO90-Zn²⁺, and DO90-Zn²⁺ and chitosan macrogels in SIF (pH 7.5) after immersion in SGF for 2h, respectively.

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